Rubber Journal and International Plastics

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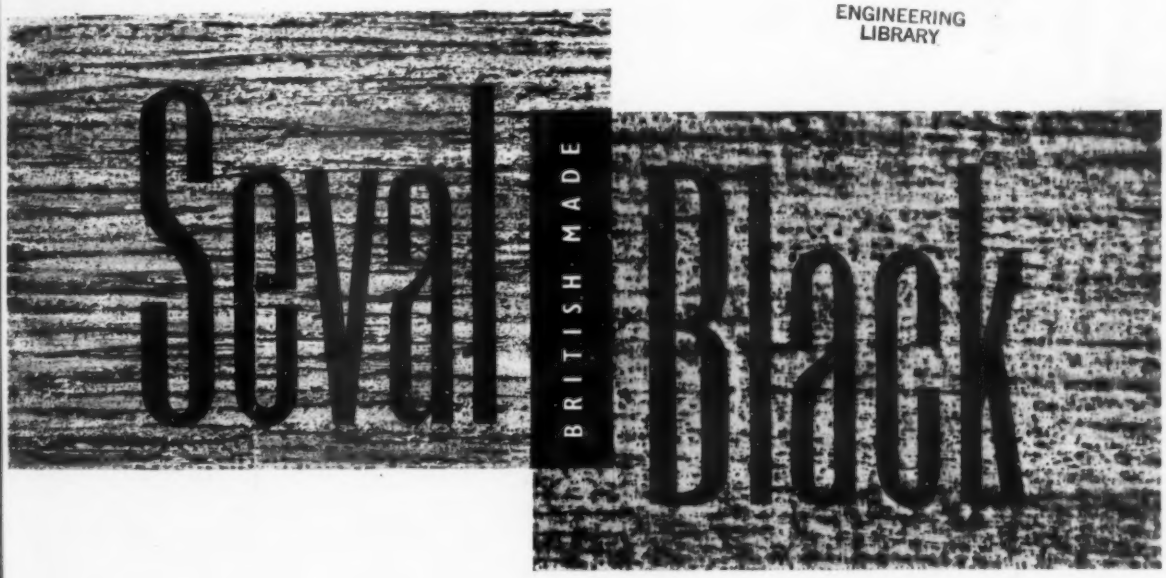

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IN ITS 75th YEAR

April 4 1959

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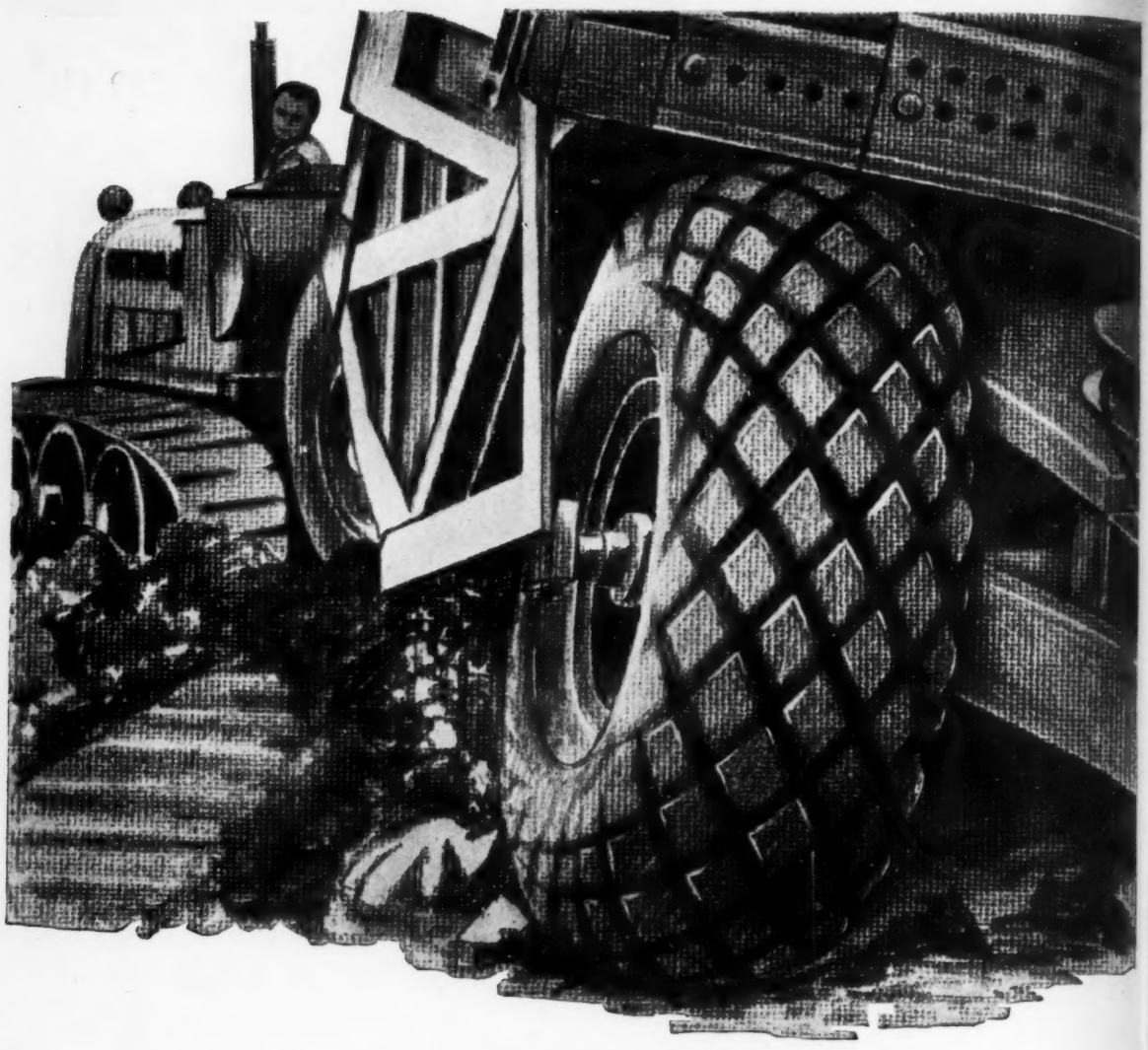

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NOTES of the WEEK

Fragmentation Inevitable

A PREDICTION that in the next few years there will be a fundamental change in the ownership of Malaya's rubber estates came from Singapore at the beginning of the week. 'There will be a gradual change in the whole complexion of plantation ownership. Rubber planting will become a cottage industry.' This somewhat unorthodox view was reportedly put forward by Mr P. J. Williams, one of the country's most experienced rubber planters. Mr Williams, who has been connected with the rubber industry for 48 years and is shortly leaving Malaya on retirement, stated that he thought the Malayan rubber industry would have a good future for the next five or six years. 'But the large plantations will be cut up and will come under the cooperative ownership of village communities. That, eventually, will be the only economic way of growing rubber. I think the fragmentation of estates is inevitable. I do not think it will be a bad thing for the country, despite anything the big company owners and labour leaders may say.' He added that he believed that eventually the cost of natural rubber would be too high to compete with synthetics.

The Opposite View

THE views put forward by Mr Williams are certainly controversial. They are also more or less diametrically opposite to those, for instance, of the Rubber Growers' Association, whose members have been, and are, engaged in a vigorous policy of replanting their estates as well as opening up virgin jungle. The aim, of course, is to take advantage of the very high yields it is now possible to obtain and, in so doing, to cut down production costs. A similar view was put forward earlier this year by Dr J. McGavack (referred to last month in these columns) until recently technical director of the Plantation Division of the US Land Rubber Co. Dr McGavack wrote, 'The future of natural rubber has never been rosier.' In the course of a very fine article (in the February *Rubber Age*) he touched on potential methods of reducing labour costs including replanting with higher yielding material, soil nutrition and the use of stimulants. In his view, the use of stimulation techniques can almost definitely ensure the production of natural rubber at a price lower than synthetic. On the other hand, recent news reports tend perhaps to lend strength to Mr Williams's predictions. The *Malay Mail* on March 26 said that increased replanting among the country's 350,000 smallholders might reach a record figure of some 130,000 acres this year. On March 28, the Malayan Government was reported as satisfied that fragmentation of rubber estates was not affecting the country's economy. The Malayan Minister of Natural Resources stated then that the Government would act if the situation deteriorated but this was unlikely on present trends. It must also be remembered that powerful trade unions are involved and these will undoubtedly do all they can to see that employment levels are at least maintained. The new rubber wage agreement which comes into force on June 1 (referred to in 'Plantation Commentary' on page 520) is an example. Reported on the same page are the comments of Sir John Hay, recently in Malaya. The natural rubber outlook, he said, might well be described as 'set fair.'

Expanding Work

WORK expands in an expanding industry. This sounds rather like a quotation from Parkinson but it describes aptly enough the state of affairs in the British Plastics Federation, whose annual report for 1958 has now been published. With the uses of plastics materials in their manifold forms extending into almost every industry; growing, in fact, in all directions, the labours undertaken by the committees, sub-committees, groups and sections of the Federation have multiplied exceedingly. The report makes it clear that the voluntary work of the relatively few members of the committees is of immeasurable value to the industry as a whole and it must, in a way, rankle that companies which are not members of the Federation can derive some benefit from work they do not support. A glance at the report would make it equally obvious that full benefits more than justify membership, for the activities of the Federation cover a very wide field indeed.

Valuable Liaison

THE need for the Plastics Institute to expand its activities, especially membershipwise with those in the fringe industries in mind, was mentioned at a recent meeting of the London Section. It is of interest, therefore, to note that the Institute has arranged a two-day conference for architects and constructional engineers to take place in November. It needs no crystal ball to tell that the building industry, now beginning to show increasing interest in plastics materials, will in time become one of the largest customers of the industry. Another move in the right direction is the cooperation of the British Plastics Federation with the Plumbing Trades National Apprenticeship Council so that plumbing apprentices can visit plastics pipe manufacturers. There is, however, plenty of room for more effort.

NEWS *Briefs*

UK TYRE CORD MACHINES FOR USSR — PLASTIC PIPE FOR ULSTER — PLANTATIONS IN GHANA FRENCH TYRE OUTPUT — MORE NR TO RUSSIA

●**Northern Ireland** — Ulster's first plastic underground water main has been laid near Comber, Co. Down. Though the material used in this project was manufactured in England, plastic piping will shortly be produced locally. Unidare Engineering Ltd., a firm which will occupy a new factory erected by the Ministry of Commerce in Portadown, hope to be producing large quantities for local use inside the next twelve months.

●**Malaya**—Russian rubber buying is giving a big boost to the Malayan economy, according to market experts in Singapore. Last month the Soviet Union bought a record 22,342 tons of rubber from Malaya. In the first two months of this year, Soviet rubber shipments totalled 26,607 tons—39% of all Malayan rubber sent to the Soviet Union last year.

●**Italy**—The Montecatini Company proposes to issue a $10m. bond loan in the United States this year, according to a Milan report. The loan would be used for industrial developments of the company in the US. At a meeting to be held on April 28 the issue of a 30,000m. lire bond loan in Italy will also be proposed.

●**Russia**—At a plenary session of the Moscow 8th Mendeleyev congress on chemistry on March 18, the director of the Soviet Plastics Institute, Akutin, reported on the creation of what he described as the first installation for continuous production of grafted polymers. This installation is based on a mechanical-chemical method which makes it possible to break the molecules of parent polymers and combine them into new substances. He expressed confidence that in the near future it would be possible to use such installations on a commercial scale.

●**Malaya**—Experts are to study whether a single commission should help run the major ports of Malaya. This commission would secure coordination between ports, common tariffs, and regulations, economical sharing of common-user services and technically qualified officers and a balanced programme of capital expenditure, says a Malayan Government report.

●**Northern Ireland** — Shell-Mex and BP Ltd. have advised the Minister of Commerce that their parent companies are in principle willing to construct and operate a refinery in Northern Ireland subject to satisfactory conditions being negotiated with the Ministry and other interested parties. The location would depend on detailed investigations but Londonderry would be given the closest consideration as a possible site.

●**Ghana**—The Government of Ghana is inviting private capital, technical assistance and knowledge for the cultivation of the country's rubber resources, according to the United States Department of Commerce. As an inducement, officials indicate that a rubber plantation covering an area of 400,000 acres in south-west Ghana will be made available for cultivation. The area reportedly has adequate low-cost labour, good transport and other facilities.

●**United States**—Sales of all types of tyres will set a new industry record at 114,000,000 units in 1959, compared to last year's total of 104,680,000, Mr J. W. Keener, President of the B. F. Goodrich Company said in Los Angeles. Consumption of new rubber in the US this year, he said, is expected to increase by about 200,000 long tons over 1958 to 1,550,000.

●**France**—French tyre production in February rose to 21,700 tons from 21,210 in January and 20,308 tons in February last year, according to preliminary figures issued in Paris.

●**United Kingdom** — Machinery worth £1m. is to be supplied to the Soviet Union by the Lancashire firm of Platt Brothers (Sales) Ltd., of Oldham. The firm has received two orders totalling £1m. for tyre cord machines. The machines will be made mainly at Platt Brothers' works at Accrington, Lancashire.

●**Malaya** — Countries producing natural rubber should take three steps to meet the challenge of the new synthetic rubbers, Mr Leong Hoe Yeng, the retiring chairman of the Malayan Rubber Producers Council, said in a broadcast interview. He urged the opening of more land for new planting, replanting as much old rubber as possible and intensive research to improve quality and lower costs.

●**Indonesia**—Sir Robert Scott, British High-Commissioner for SE Asia, paid an unofficial visit lasting several days to Medan, North Sumatra. It is understood that he was primarily interested in industrial developments, especially in connexion with the British rubber estates in that area.

'Which reminds me, if you haven't already met the new foreman—watch him?'—433

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Rubber Linings*

THEIR USE IN CHEMICAL PROCESS EQUIPMENT

THE outstanding resistance of rubber has led to its wide use in lining chemical plant. The storage and handling of hydrochloric acid is a good example of a case where rubber is the only material which can be used with any degree of satisfaction. For most chemicals used in standard engineering processes, it is possible to design an anti-corrosion rubber lining.

Recent developments in synthetic rubber and rubber-like materials have considerably widened the scope of application of such linings. Tanks, vats and vessels of all sorts including autoclaves, vacuum vessels, reactors, pickling tanks, plating tanks, railway tank cars, pipes for conveying chemicals in solution, valves for chemical pipe lines, stirrers, drums, barrels, fume stacks, etc., can all be lined satisfactorily. Mild steel is the most widely used material for rubber-lined equipment and excellent adhesion can be obtained. Cast iron could also be used, provided the castings are free from porosity. In many instances where a designer specified stainless steel for tanks and the like, adequate service could be obtained by using rubber-lined containers of mild steel. As the proportion of nickel in alloy increases, adhesion of rubber decreases. Chromium is of no particular importance to adhesion. Copper is undesirable as a constituent of the alloy. Rubber can be bonded to aluminium equipment, but the bond strength is not as good as in the case of steel. Linings can be applied to various kinds of brasses but demand for such construction has been small. The most satisfactory composition of adhesion is 60–70% copper with the remainder made up of zinc and not more than 1% tin. When required, tanks made of wood or concrete can be provided with rubber linings for holding acids or other chemicals. Wood and concrete are the least desirable for lining because they do not lend themselves readily to lining application processes and they cannot be tested electrically for leaks.

It must be clearly understood the chief purpose of a rubber lining is to provide resistance to chemical action and abrasion and to prevent the contamination of the contents of a vessel or a pipe system. The lining is not designed to contribute anything to the mechanical strength of the metal structure. The tank or other container should be strong enough to withstand all the stresses likely to be encountered in service. When a vacuum is involved, the container has to be tested and approved for vacuum service, because a leak might cause premature failure of the lining.

Natural Rubber Suitable

Now coming to the consideration of the nature of the lining itself, formulations based on natural rubber are suitable for most purposes. For some very special applications, the choice may extend to one of the special purpose synthetic rubbers or rubber-like materials. Both hard and soft rubber are used. Tanks, pipes, etc., can be covered with hard rubber or ebonite, the thickness varying from $\frac{1}{8}$in. to $\frac{1}{4}$in. depending on the severity of corrosion. Hard rubber is thermoplastic and maximum safe operating temperature is 150°F. Hard rubber linings are more easily damaged by impact and by temperature changes and are more difficult to repair. In plants subject to the danger of mechanical damage and to repeat cycles of temperature change, chemical resistance may have to be sacrificed to some extent by using soft rubber linings. These linings have greater resistance and withstand abrasion better.

In general, rubber linings have outstanding resistance against all concentrations of acids, alkalis and salts which do not have an oxidizing action. Natural rubber is not recommended for nitric and concentrated sulphuric acids, chrome plating baths and bleaching agents. It is also unsatisfactory where oil and greasy conditions exist. Suitable linings can, however, be formulated from special purpose synthetic rubbers and elastomeric materials which will withstand these conditions also.

Some important considerations should be kept in mind in the design of tanks to be lined with rubber. Very large tanks are made in sections. Each section is rubber covered and the tank is then assembled with rubber gaskets to seal the joints. Linings are applied by hand; so all inside surfaces of tank must be accessible. Because of high labour costs, the design that permits rapid application of the lining is the most economical. Linings are easier to apply over a welded seam than a riveted one, therefore welded seams are preferred. All sharp and irregular places should be removed; *e.g.* weld spatter, burrs, porous spots, sharp, irregular or rough edges of plates, sharp edges of nipple outlets, exposed threads of nipple flanges or pipes and irregular weld head.

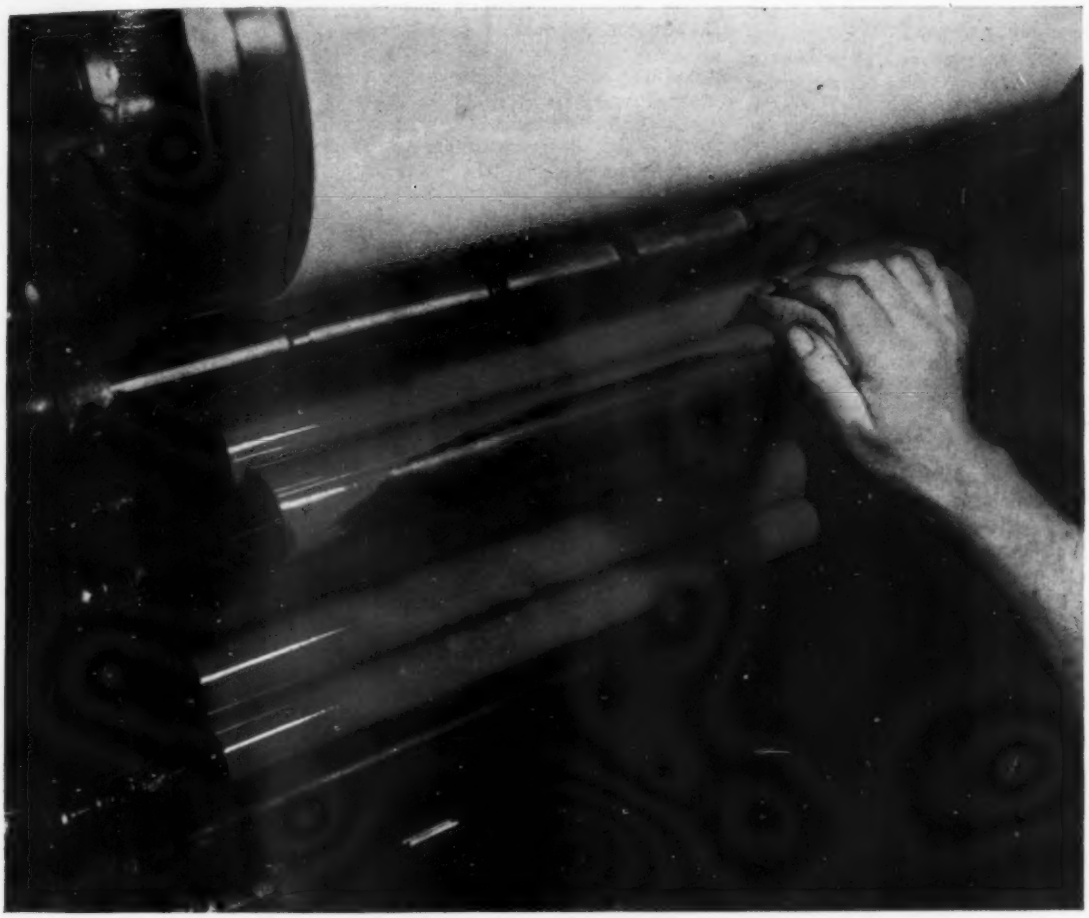
All corners should have a radius of at least $\frac{1}{4}$in. Manholes for entrance of workmen should be at least 18in. in diameter. Flange type outlets should be used so that rubber can extend over the flange faces. Rubber lining reduces inside diameter of nipples and this must be allowed for. The same precautions about roughness, etc., also apply to castings as to mild steel plate parts. Grey iron having a close grain in essential. Inspection for porosity should be made after sand blasting. Sometimes hard spots can be drilled out and filled with a threaded steel or iron plug or by welding. No other metal or iron cement is satisfactory. Metal parts should be unpainted and free from oil, grease, excessive scales, rust, etc.

Concrete Tanks

Concrete tanks must be so constructed and situated that the rubber lining can be taken over the rim and down the outside for a minimum of 3in. All corners, edges, etc., must be rounded off with a radius of not less than $\frac{1}{4}$in. The concrete generally should be in accordance with a best accepted practice and specification. The concrete must be thoroughly dried out before rubber covering is started. The use of rubber-lined wooden tanks is not recommended. Wooden tanks in first class condition can, however, be covered. The wood should be well seasoned and the surface should be free from knots, holes or resinous materials. Reinforcing struts should be on the outside of the tank, if possible. No paint or creosote should be applied to the surface of the wood.

The rubber lining of tanks, etc., is a highly specialized job which only

* *A paper by Dr. I. V. Krishnamurti (National Rubber Manufacturers Ltd.) at the Symposium on Corrosion and its Prevention organized by the Society for Corrosion and Coatings Technology, Calcutta, December* 1958.



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a rubber manufacturer can undertake. Steps in the fabrication of a typical rubber lining are as follow:

1. All metal areas to be covered must be freed of rust, scale, oil, etc., until they present a bright surface. Sand or shot blasting followed by degreasing with a solvent like trichlorethylene is generally satisfactory.
2. Several coats of adhesives or bonding agents are applied.
3. Sheets of rubber suitably compounded to withstand the required service conditions are prepared on the calendering machine. The semiplastic, tacky unvulcanized sheet is applied by hand to the metal surface and all seams are hand rolled to ensure good contact. Rivet heads are covered with a preliminary layer of rubber before application of the main sheet. Special care is taken to eliminate trapped air.
4. After the lining is in place it is vulcanized where possible by placing the entire tank in a steam autoclave. In the case of closed tanks, steam may be admitted into the lined chamber under pressure. Large open tanks which cannot be moved into an autoclave can be vulcanized by filling them with hot water or hot brine or by steam jets, the operation taking several hours. Very large tanks are made in sections. Each section is separately rubber lined and assembled finally, with rubber gaskets to seal the joints.

The rubber lining is electrically tested for leaks as follows:—A device very similar to an ultraviolet ray machine may be used. The applicator is moved over the surface of the lining. Normally a faint bluish discharge evenly over the lining can be seen. When the applicator reaches or merely comes near a break in the rubber or even weak spot, the discharge is concentrated into a bright blue spark accompanied by a distinct crackling sound.

Rubber-lined Pipes and Fittings

The use of rubber-lined metal pipes combines the high corrosion resisting properties of rubber with the rigidity and strength of metal. Linings compounded to resist the action of a wide range of corrosive liquors can be applied to pipes of all bores of 1in. diameter and over. After the interior of the pipe is cleaned and coated with adhesive, an unvulcanized rubber tube is drawn through it and expanded against its sides by air pressure. The vulcanization is completed in much the same manner as for tank linings. Usually the flanged type of pipe will be found best suited for all jobs. The joints between the pipe and flange must be fully welded on face. The weld must be ground flush on face. Branches on piping should be easily accessible to facilitate lining operations. Threaded outlets cannot be rubber lined. They must be flanged and welded.

Joining Sections

When joining sections, rubber lining is brought out over each flange, so that when the two flanges are bolted together, there is a rubber-to-rubber seal. When the lining is of soft rubber, it extends up to the flange bolt holes. Two asbestos gaskets are placed between uncovered parts of flanges limiting the degree of compression of rubber to ⅛in. When made of hard rubber, the lining extends over the entire flange face and a gasket of soft rubber is used between the hard rubber surfaces.

The following are some of the typical materials which can be conveyed by rubber-lined pipe systems: Purified water, acids such as acetic, phosphoric, hydrochloric and sulphuric, powdered coal, flue gas wash water, ore slimes and mill tailings, mine water, paper mill pulp and bleach liquors, sand and gravel in dredging work, waste acids in steel plants, sewage disposal, etc.

Valves and other fittings used in conjunction with rubber-lined pipes are so designed that the liquid comes into contact only with rubber. The lining may be bonded to the metal. Alternatively, the valve may have a renewable rubber lining.

Outside Protection

There are other applications of rubber used in the form of an outside lining as a protection against abrasive materials. Some examples are chutes and hoppers handling ore, sand, gravel, impellers for flotation of work, fan housings, fan blades, collectors for handling abrasive dusts, dredge pump liners, centrifugal pump linings, sand blast cabinets, etc. The process of lining is essentially the same as for tanks.

This review is not exhaustive, but is intended to draw the attention of engineers to the scope of application of rubber as a lining material to combat corrosive action of chemicals and of abrasive materials. Collaboration of designers and manufacturers of equipment to handle such materials is bound to be extremely fruitful. Such collaboration at a very early stage may mean a simplification of design and economy in the overall cost.

Tyre Plant in Malaya

The Bridgestone Tyre Co. Ltd. is considering the possibility of setting up a 10 million Malayan dollar plant in Malaya. Mr Ideguchi Moriyuki, a director and manager of the firm's overseas division, is visiting Kuala Lumpur to get first-hand knowledge of conditions. He stated that he hoped the proposed factory would come under Malaya's pioneer industries ordinance, which gives tax reliefs for certain new industries. The firm was negotiating with Malayan financiers to put up a part of the capital.

Mr Moriyuki said the tyre factory would employ about 1,000 Malayans. Malaya had been chosen because of its political and economic stability. Skilled technicians would be brought from Japan and Malayans would be sent to Japan for training. His firm in Japan imported at least 30,000 tons of rubber every year from Malaya.

Goodrich's New Tyre

B. F. Goodrich Tire Company, a division of B. F. Goodrich Company, has started production of a steel cable truck tyre that, it is claimed, gives up to 20% more mileage than conventional truck tyres. The new tyre, called the 'power express steel cable,' uses steel cords to reinforce the rubber carcase.

Thirty-nine high tensile filaments, .0058in. in diameter are twisted to form each of the hundreds of cords in the tyre carcase, according to Mr E. F. Tomlinson, president of the company. Mr Tomlinson said 'the two-ply steel cable tyre will reduce the incidents of flats from punctures by as much as 90% and will practically eliminate bruise breaks in the tyre carcase.'

Two Dunlop films, 'The Power to Stop,' which deals with disc brakes, and 'The Care and Maintenance of Conveyor Belting,' have been selected for showing at the Industrial Film Festival at Harrogate next month.

Electrical Aids in Industry

Data Sheet **No. 4**

Resistance Heating-1

In this form of heating, the heat is produced by passing an electric current through a high resistance conductor which is termed the " heating element ".

The heat is transferred from the heating element to the work by convection, radiation or conduction, or by a combination of any, or all of these. When it is a question of radiation or convection, the element can be a bare wire or strip of suitable material, provided it is adequately supported on electrical insulation capable of withstanding the temperature.

When there is to be contact between the work and the element, heat being transferred to the work by conduction, the wire or strip must be surrounded by suitable insulating material and enclosed in a protective sheath.

In the majority of cases, the wire or strip forming the heating element is made of a nickel-chromium alloy which has a high electrical resistance and can be safely used in air at temperatures of up to 1050°C., or in a suitable atmosphere, of up to 1150°C. Other element materials are available for use at higher temperatures.

Sheathed elements, essential for contact heating but also used widely for convection and radiation heating because of the convenience afforded by the mechanical strength of the sheath, usually metallic, and by their "built-in" electrical insulation, cannot be used at temperatures as high as the bare wire or strip. This is because the wire, being embedded in insulation, is always at a higher temperature than the sheath, and to keep the wire temperature down to a safe figure the sheath temperature is usually limited to a maximum of around 800°C.

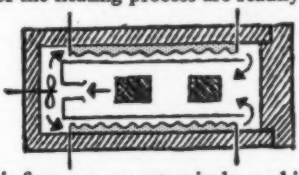
Automatic temperature control of resistance heating elements within narrow limits is easily effected, but if manual control only is desired, devices are available which enable the heat output of the elements to be controlled precisely at a required level. As with all electrical methods, a time switch may be included in the control circuit for automatically switching on or off at predetermined times, and this can enable, for example, an electric oven to be fully up to working temperature by the time the working day starts. Since there are no combustion products from the heaters, there is no need to build flues or special ventilating arrangements which also carry away useful heat.

Electric resistance heating may profitably be put to many diverse uses; two of these are described briefly below, others will be listed in a subsequent data sheet.

Furnace Heating

Electric resistance furnaces can be divided into two main categories, batch type and continuous. In most cases, the heating elements are of nickel-chromium alloy, for furnace temperatures up to around 1050°C., but higher temperatures, up to nearly 3000°C., can be obtained by using other metals or alloys, or in some cases non-metallic elements. A protective atmosphere is desirable to prolong the life of some of these higher-temperature elements. For all temperatures, electric resistance furnaces can be constructed so that the heating process takes place in a controlled atmosphere if this is dictated by the composition or heat requirements of the work charge. In some furnaces, fans are used to circulate the air or special atmosphere over the charge, thereby giving increased heating rates and a uniform temperature over the whole charge.

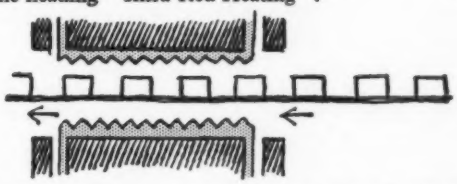
Automatic temperature control and programme control of the heating process are readily effected.



Electric furnaces are extensively used in industry, for example in the general heat treatment of metals, in the glass and ceramics industries, for brazing and sintering, and for many other applications requiring temperatures above 500°C.

Oven Heating

There are two basic forms of heat transfer used in electric resistance ovens: convection and radiation. The latter is dealt with in a separate data sheet under the heading " Infra-Red Heating ".



Convection ovens may again be of the batch or continuous type. In either case, the charge is heated mainly by the movement of hot air, which is sometimes assisted, as in furnaces, by fans to give a rapid and uniform temperature rise. Ovens are normally designed for temperatures of up to about 500°C., and the heating elements are invariably of nickel-chromium or nickel-chromium-iron alloy.

Ventilation, when required, can be provided and regulated entirely to suit the heating process. Temperatures and times are readily controlled. A vacuum can be maintained in suitably designed ovens to assist in the extraction of moisture and solvent.

Convection ovens are extensively used for drying, baking and stoving operations, and for a host of other processes requiring a low or medium temperature.

For further information, get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, W.C.2.

Excellent reference books on electricity and productivity (8/6 each, or 9/- post free) are available—"Induction and Dielectric Heating" is an example; "Resistance Heating" is another.

E.D.A. also have available on free loan a series of films on the industrial use of electricity. Ask for a catalogue.

6780

Advertisers Announcement

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Rubber and Plastics News

CONTINENTAL AND FOREIGN DEVELOPMENTS

A PROCESS known as the 'drop and cover' method has been invented in China for preparing replicas for the substitution of metal specimens in metallographic study. It is carried out by applying first a few drops of an organic solvent on a prepared surface of a metal specimen, and covering with a sheet of cellulose acetate or similar material. As a result of the softening action of the solvent on the plastic sheet and the exclusion of air between the metal surface and the sheet, atmospheric pressure brings them into complete contact, so producing a 'negative' replica. A 'positive' replica may be made from this when required. These replicas can be directly used for metallographic studies either on a biological or on a metallurgical microscope without modification.

Hydrocarbon Oils

Non-corrosive hydrocarbon oils come from the Netherlands. These are wholly or partly free from mercaptans and other sulphur compounds as a result of treatment with a hypochloric solution of pH less than 9, and then with alkali metal mercaptides. They are finally brought into contact with alkali hydroxide (NaOH). A solutizer such as a phenol or phenolate or alkyl ditto is included.

Resins for Pattern Making

Synthetic resins are being increasingly used for making patterns in Germany. Many of these resins have been found to possess good mechanical properties, moisture and ageing resistance, excellent adhesion on metals, and stability. The advantages in general are quick and low cost production, unlimited capacity for copying, and little wear. Care has to be exercized during production because of tension sensitivity, lower fatigue limit and temperature dependence.

Japanese Research

The Japanese have been studying the dispersion coating of polytrifluorochlorethylene. Considerable change of shape has been found to occur in the fused particle during baking. Strongly adhesive coatings are obtained on aluminium and steel pretreated by grit blasting. The adhesiveness was low on copper alloys unless they had been plated with chromium or nickel.

Vacuum Metallizing

Most plastics have proved suitable, it is said in Germany, for vacuum metallizing. The vapour pressure of the material for this purpose should be below the depositing pressure of 10^{-4} Torr, and no more gas should be liberated than the pumps can easily exhaust.

Microporosity

The elimination of microporosity in defective castings is being achieved in France by the injection into the holes of a synthetic resin, followed by heat-treatment designed to provide adherence, mechanical strength and corrosion resistance to the injected material. The same procedure is also employed in Germany, where the material injected is the thermosetting epilox adhesive M26. The parts to be impregnated are cleaned and degreased, *e.g.* pressure-resistant castings, and impregnation may be by simple infiltration, by pressure or vacuum, by a combination of pressure and vacuum, and by the application of ultrasonics.

Coating and Soundproofing

The Japanese have been carrying out experiments with clear lacquer coating on plated zinc die castings. The most practical was found to be a vinyl lacquer. The new plant of General Motors do Brasil, near Sao Paulo, has a roof with a metal-panel ceiling suspended from the roof I-beams by rods and rubber bushing. The space between the roof and the ceiling forms the exhaust-air plenum chamber. Water lines, electric conduit and other pipes have rubber scrubbers installed to damp out much of the vibration. The object of this and other innovations is to make the factory soundproof as far as possible.

Polythene Coated Pipes

Protection against the corrosion of large filter pipes in well construction is a special problem, because the presence of tightly packed gravel combined with the high pressures met with at great depths exerts considerable mechanical stress, which, in general, adversely affects plastic pipes. A method has been developed in which steel pipes of different types are coated with polythene, which is both mechanically strong and adheres well to the metal pipe. These polythene coatings, the Germans claim, give excellent protection against chemical and electrolytic corrosion.

Australian Epoxy Resins

Australia's first plant for the manufacture of epoxy resins is to be built at Clyde, Sydney. It is expected to be completed early in 1960 and will cost over £A.600,000. It will manufacture both liquid and solid grades of resins, and is designed not only to meet present needs, but also to allow for future expansion as the expected demand increases.

Corrosion

The corrosive effects of plastic on metals have been studied in Germany. It is obvious that plastics employed in combination with metal should not exert any corrosive effect on the metal, particularly in damp or tropical climates, *e.g.* when used as insulation for telephone networks and electrical instruments. Various methods of test have been developed and the probable causes of corrosion suggested. The effect was first observed with hard paper and fabric, and later on other combinations. The actual cause has not yet been fully explained, although it is believed to be the result of electrolytic action. With hard paper and all filled plastics, the filler no doubt plays a decisive part. By suitable means of impregnation this may to some degree be controlled, and research in this direction continues.

Pipe-line Protection

The protection of underground pipe-lines in Germany has been considerable of recent years, especially with PVC and polythene wrapping. Gas and water lines, telegraph and telephone cables, and mining, including oilfields, are examples of fields of application. The French have been coating metals with plastic, applied either as paints, varnishes, organic enamels, or by fusion or induction as paste or resin without solvent. The principal groups of plastics used are thermoplastic, such as polythene or PVC, hard or plasticized; thermohardening, such as

polyesters and epoxy resins; and the fluoro-plastics and rubbers and rubber derivatives. The application has been to anti-corrosive, electrical and thermal insulation, mechanical, low friction coefficient, abrasion resistance, decorative and anti-adhesive purposes.

Flame-Sprayed Plastics

Another research in Germany has been devoted to the corrosion-resistance of flame-sprayed plastics. Sprayed-on PVC and polyamide layers are used as well as pipe-line insulation on variously treated or untreated steel, and on steel flame-sprayed with metal, such as hydronalium and pure aluminium. The corrosive media included sea-water and marine climates, artificial or natural. The PVC and polyamide layers showed good stability, but the pipe-line insulation corroded after a brief period of time. The use of cathodic protection improved the anti-corrosive effect of the sprayed layers.

Epoxy-Coated Tanks

Tank cars in China are being experimented with by treating them with an epoxy coating, the object being to give protection against light oils, leaded spirits, etc. At the moment the process is costly, but it is confidently anticipated that in the long run it will prove highly economical for reasons carefully indicated. The cured paint film has been found exceptionally tough and hard, and damage from abrasion is reduced to a minimum. The coating is expected to last for several years of service, estimated at about five. Maintenance and cleaning are materially reduced.

Coating Sheet Metal

From Belgium comes a method of coating sheet metal with plastic. The metal is heated to keep the adhesive soft, and a heated film of plastic material is then applied under moderate tension, and the whole progressively pressed.

Flexible Doors

Flexible doors in rubber or plastic material of transparent type have been introduced to resist an intense circulation of the maintenance engines, which can push the door sections and free the openings without special precaution, and without any pause, and above all, without injury to the material. These doors are made up of brackets which pivot round an axle supported by a ball bearing. The flexibility of functioning is extremely high, and the bracket, entirely frameless, has no harmful effect upon this. A mechanical device for automatic realignment, operating in either direction, ensures rigorous closing after the passage of the vehicle. This patented system employs essentially the action of spiral springs and lateral adjusting arms placed on the upper part of the bracket. By means of a 'small drum' it is possible to control the hardness of this adjusting device. The simplicity of mounting allows these doors to be adapted to all openings, even those without frames.

Polystyrene Hut

For French Army requirements, a bell-shaped hut has been constructed which is made up of a chamber in expanded polystyrene covered with sheets of aluminium with small corrugations, assembly being achieved by adhesion under pressure of the sheets, coated with neoprene, on the polystyrene plates, which are themselves covered with a rubber emulsion. The hut consists of twenty-six panels assembled together by various accessory pieces. It comprises a door, five windows, whose illuminating portion is in reinforced polyester, the reinforcement being of fibreglass, and an axial skylight. It weighs less than a ton and can be erected in an hour and a half by four unskilled operatives. Once dismantled, the entire structure can be loaded into a lorry. Besides its military uses, this portable and light construction can be put to various civil uses.

Self-cleaning Condensers

The self-cleaning of condensers by a continuous process comes from Switzerland and is of great interest. In this process, the intake and discharge conduits for the circulating water of the condenser are partly by-passed by a series of return pipes. A special recycling pump drives back a relatively small fraction of the circulating water. This current carries balls in a closed circuit, without any disturbance of the normal working of the turbine. The balls are of rubber (spongy), and introduced above the condenser, are carried by the circulating current across the collection of tubes which they clean. They are then collected lower down by an assembly of recovery grids, sucked up by the pump into the by-pass pipework, and reinjected at the entrance of the condenser, accomplishing in this way a closed circuit in a continuous manner. The number of balls in circulation represents only about 5 to 10 per cent of the number of tubes. Experience has shown that when injected at points carefully determined, the balls distribute themselves uniformly, thanks to their density, which ensures their equilibrium in the water. They are replaced when their diameter is reduced by wear to less than that of the tubes.

Vulcanized Brackets and Buckets

Brackets and buckets of great capacity have been put on the market in France, and are vulcanized on conveyer belts. The essential property of these buckets is their triangular profile with unequal sides. They are hollow, flexible enough not to present any rigidity when deformed, and sufficiently resistant to ensure carriage of the materials. Buckets and brackets are obtained by moulding and vulcanization on the belt. Holes can be arranged in the side to prevent scooping up of water in the case of immersed elevators. Numerous advantages are claimed, including the possibility of considerable linear speeds, and thus high transporting capacity; the possibility of obtaining inclinations to the vertical; silent operation; low power consumption; moderate net cost and considerable economies both by the conveyor belt itself and in relation to metallic elevators.

Latex and Plastisols

Latex and plastisols have many points in common as regards processing and application, and therefore makers can readily convert from one material to the other. Plastisols are more easily processed and have superior possibilities for automation. A French writer has shown how equipment may serve both purposes. From the point of view of properties, both materials have advantages and drawbacks, the importance of which depends on the application. Plastisols cost more, but are less expensive to process and need fewer hands. The French largely favour latex for such goods as toys and balls.

Forthcoming Exhibition

A large number of companies in the rubber and plastics industries will be exhibiting at the Engineering, Marine, Welding and Nuclear Energy Exhibition which is to be held at Olympia, London, on April 16–30. These will include the Andre Rubber Co. Ltd., Surbiton, Surrey; the Beldam Packing and Rubber Co. Ltd., London, E.C.3; British Industrial Plastics Ltd., London, W.1; the John Bull Rubber Co. Ltd., Leicester; the Distillers Co. Ltd., London, W.1; Imperial Chemical Industries Ltd., Millbank, London, S.W.1; Metalastik Ltd.; the North British Rubber Co. Ltd., Edinburgh; the Northern Rubber Co. Ltd., Retford, Notts; Precision Rubbers Ltd., Bagsworth; and RFD Ltd., Godalming, Surrey.

FBRAM at RABRM

TECHNICAL COMMITTEE VISIT

THE Technical Committee of the Federation of British Rubber and Allied Manufacturers held its March 24 meeting on the premises of the Research Association of British Rubber Manufacturers at Shawbury, and after their meeting were entertained to an excellent lunch by their hosts.

Also present at the lunch were four members of a committee set up by the Dunlop Rubber Co. and the Dowty Group which had met the Technical Committee earlier in the morning to place before them problems they are examining in connexion with rubber engineering specifications. In addition, the Federation had invited Dr L. Bateman and two of his staff from the British Rubber Producers' Research Association at Welwyn, Dr E. G. Cockbain and Mr L. Mullins, who came to Shawbury on that day to meet the committee and attend a short meeting with Research Association staff.

Research Activities

At this meeting the heads of the Intelligence, Technology and Research Divisions gave a short account of the current activities of the Research Association. Mr T. H. Messenger described the emphasis now being placed on rapid replies to queries on rubber literature, and also mentioned that the Association had undertaken to publish a cover to cover translation of the important Russian periodical 'Kauchuk i Rezina.'

Mr R. C. W. Moakes described the multifarious activities of the Technology Division and mentioned, in particular, the work that the division are doing on the adhesion between rubber and man-made fabrics. Mr Moakes and members of the Federation emphasized the importance of regular contacts with members through liaison visits to factories.

Dr W. C. Wake described the work of the Research Division, including the work of the Physics Department, on the 'shape factor' in rubber engineering applications and the investigation of the friction of plasticized PVC against steel to form a scientific background to aid belting manufacturers in their changeover from natural rubber. He also mentioned the work currently engaging the Chemistry Department on the ageing studies of rubbers and on the preparation and investigation of properties of graft polymers. Chairman Mr F. H. Puxty and Dr Bateman made helpful comments following on these brief reports.

The Federation were then shown round the laboratories and, in particular, their attention was directed to the curometer which the Association have now almost completely investigated to the stage at which it will be a useful machine for dealing with vulcanization characteristics of compounded rubber stocks. The visitors also saw the unirotor mixer which has been recently acquired to aid the researches into graft polymers.

Finally the Federation viewed the new laboratory which has been set up to carry out physical testing on plastic materials as one of the ways in which the Association is venturing further into the field of plastics.

Cape Asbestos Acquisition

The Cape Asbestos Co., has acquired the whole of the share capital of William Turner (Kismet) Eyre Works, Sheffield, old-established manufacturers of high quality equipment and accessories for the motor trade. The business will be closely integrated with that of the Weaver Manufacturing and Engineering Company, also a wholly-owned subsidiary of the Cape Asbestos Co., and the board and management will be the same for both companies.

Conversion Kit

Conversion kits to enable conventionally sprung vehicles to be fitted with pneumatic suspension systems can now be supplied by Dunlop. The kits are designed and engineered to avoid extensive modification and cost, and can be readily fitted. This equipment has already been installed in vehicles having a range from 10 tons to 30cwt., and also in trailers. The range can be extended to cover all applications.

Laminated Plastic Design

In the Royal Society of Arts Industrial Art Bursaries Competition for 1958, the Bursary for design in laminated plastics (£150 donated by Bakelite Ltd.) was awarded to Miss S. C. Williams, Stockport School of Art. Those commended were Miss A. E. Banks, City of Carlisle College of Art, W. D. James, Royal College of Art, and Miss G. J. Wallace, City of Carlisle College of Art.

POLYMER CHANGES

Dr E. J. Buckler, vice-president, Research and Development for Polymer Corporation Ltd., has announced a change of organization of the Research and Development Division on a project basis. Mr N. J. McCracken, assistant manager of the division, will assume responsibility for the overall programme under Dr Buckler. Dr H. L. Williams, who has been appointed projects manager, is responsible for the activity in the major fields of research and development, each of which will be under a project supervisor.

Mr McCracken joined the Polymer project on January 1 1942 as a chemical engineer with the Canadian Synthetic Rubber Ltd. He advanced to become manager of that company before its absorption into the present unified Polymer Corporation Ltd. A graduate of the Polytechnic College of Engineering, Oakland, California, he is a native of Medicine Hat, Alberta. Prior to joining Polymer Corporation, he was a chemical engineer for Defense Industries Ltd.

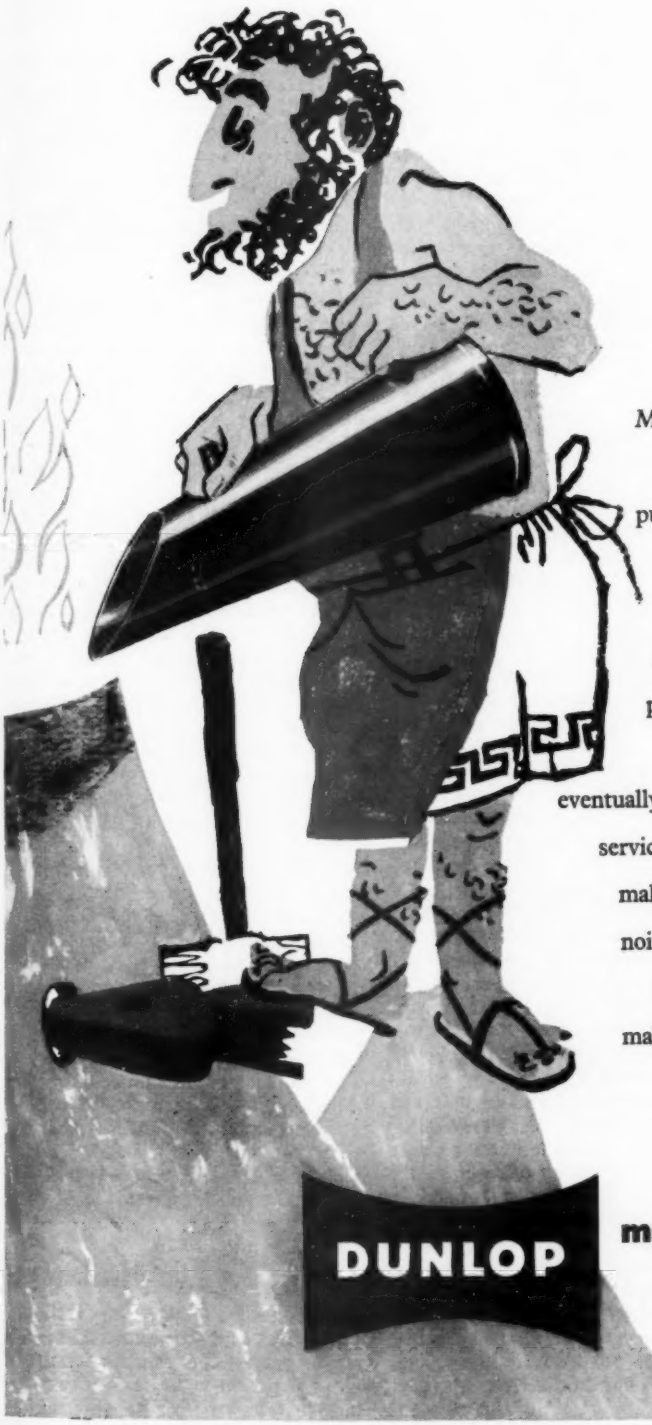
Dr H. L. Williams was born in Watford, Ontario. He received his Ph.D. in Physical Chemistry from McGill University in 1943. Following fellowship research at the University of Western Ontario and McGill University, he came to Polymer Corporation, Research and Development Division, on August 1 1946. He has travelled extensively for the company and is the author of many scientific publications in Canadian, US and European journals. He is also the holder of numerous patents. Dr Williams is a Fellow of the Chemical Institute of Canada, a Fellow of the American Chemical Society, a member of the Society of Chemical Industry and the Faraday Society. He is also a member of the Senate of the University of Western Ontario.

Fragmentation of Rubber Estates

The Malayan Government was reported recently as satisfied that fragmentation of rubber estates was not affecting the country's economy.

Malayan Minister of Natural Resources, Inche Bahaman bin Samsuddin said there was no justification for legislation at the moment. It was true that some estates had been fragmented. The Government was closely watching the situation but it was satisfied that it was not affecting the economy. The Government would act if the situation deteriorated but this was unlikely on present trends.

no joke without fire...



MOST of the legendary figures of mythology seem to have lived it up, in a remarkable variety of fancy pursuits. Not so Vulcan, god of fire and furnace. He could claim to be one of the first industrialists. Little did he dream that the application of *heat* to rubber and sulphur would later engender a process called "vulcanisation". Or that another hot "mix" — rubber and phenolic resins — would eventually produce FORTIFLEX, a Dunlop material of infinite service to home, business and industry. This material is malleable but extremely hard-wearing, non-corrosive, noiseless, rustproof, stands any amount of assault and battery and can be "tailored" to specification — to make anything from industrial containers to domestic dustbins, coke hods to wheelbarrow bodies. It is yet another of the rewards of Dunlop research.

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CH/PRS/6

BPF Annual Report

FEDERATION'S BUSY YEAR

THE activities and continued progress of the British Plastics Federation are summarized in the annual report of the Chairman and Council for the year 1958. One of the most valuable aspects of the Federation's activities is the work of the technical committees. The main technical committee which superintends technical work done within the Federation has considered the nomenclature of polythene and has recommended that there are no technical grounds for a change from that term, but that different types of polythene should be distinguished by reference to their density, *e.g.*, 'polythene density 0.930.' The committee has also considered means of implementing the use of BS 2782—standard methods of test for plastics—and has ruled that wherever possible reference should be made in material specifications to that BS in preference to the inclusion of detailed methods of test. It has, however, agreed that where major changes in standard methods are required in such specifications, the method should be described in full.

The main technical committee, as described in Appendix C of the report, has approved the submission of a table of properties of, and a chapter on, high strength laminates, to the SBAC for inclusion in that society's drawing office handbook, which will also contain a chapter on polystyrene in the preparation of which the polystyrene sub-committee gave assistance. Information on plastics materials for refrigeration has also been collated at the request of the British Refrigeration Association and the Technical Research Association has been assisted in the preparation of monographs on plastics materials for electrical insulation for the proposed International Electrotechnical Commission Encyclopedia.

Range of Work

The impressively wide range of the work undertaken during the year by the Federation's technical sub-committees reflects the increasing use of plastics in more and more industries. The report outlines current and completed work by sub-committees for analytical methods; impact testing; toughened polystyrene sheeting and toxicity. Among other things, Codes of Practice for the fabrication of rigid PVC sheeting and for the fabrication and selection of materials in connexion with reinforced plastics lifeboats are being prepared. The sub-committee for the latter consists of representatives of the Reinforced Plastics Technical Committee, the Ship and Boat Builders' International Federation and the Ministry of Transport and Civil Aviation. It was formed with the object of providing the Ministry office surveyors with guidance on assessing the satisfactory consideration of lifeboats. Members of the sub-committees and other Federation groups have been equally active. The committee of the Plastics Material Manufacturers group, moulding materials manufacturers section, has for instance completed revision of BS 771:1954, phenolic moulding materials and submitted this for consideration. BSI Committee TLE/13, materials and finishes for telecommunication equipment and components, has been assisted with recommendations for materials and finishes.

PVC Specification

The PVC compounders' section has prepared a first draft specification for high impact rigid PVC compound and is working on methods of testing for inclusion in the specification. This committee has also considered a chapter on PVC materials for the SBAC handbook. In connexion with the work in the calendered PVC sheeting section on specification for PVC sheeting for hospital use, extensive test programmes on extraction by soap and oils, plasticizer migration, heat ageing, anti-static properties and 25% modulus have been carried out. The technical committee of the moulders' group is engaged in considering the preparation of reports of automatic moulding and alkyd moulding and has successfully amended the inclusion of a clause in BS 2026:1953, tolerances for moulding in thermosetting materials, for finer tolerances than those originally contained. The newly instituted press guarding committee is working on a complete revision of BPF publication number 7 on specifications for safety devices on hydraulic presses used in the moulding industry, and other safety precautions.

In the fabricators' group a great deal of work has been done by the sections for laminated materials fabrics; flooring; vacuum forming; plastics-coated fabrics and protective clothing.

Fluorocarbons' section formed during the year, has set up a technical committee to consider the preparation of specifications for PTFE moulding and extraction materials; thickness tolerances and tolerances in connexion with dispersion coating and the permeability of fluorocarbon polymers.

Federation Services

The report, which contains 15 sections and seven appendices, notes, with reference to the library abstracts and information services provided by the Federation, that subscriptions to the Abstracts have still continued to rise and that over 9,000 enquiries, average of 35 per working day, were dealt with during the year under review. A very sound move was the making of arrangements in co-operation with the Plumbing Trades National Apprenticeship Council for plumbing apprentices to visit works producing plastics pipes and fittings. The extruder section initiated the establishment of a joint committee between the Federation, the Plastics Institute and the City and Guilds of London Institute to prepare a syllabus for courses in plastics plumbing, and to arrange for information to be provided to teachers and lecturers on this subject.

Federation publications noted in the report include: surface coating resin index; tolerances for the machining of thermosetting laminated plastics, and a specification for tube for cold water services made from high density polythene of which two editions were published during the year.

On reorganization it is noted that the finance sub-committee is giving detailed consideration to a new subscription structure and it is anticipated that proposals will be put before the Council during the first half of 1959. Total membership at the end of 1958 was 291.

Plastics in Building

The Plastics Institute has arranged a two-day conference, intended mainly for architects and constructional engineers, which will be held at the headquarters of the Royal Institute of British Architects on November 19 and 20 1959.

BRIDGE – NATIONAL

PACKLESS AUTOFORM

Tyre Vulcanising Press

The Packless Autoform Tyre Vulcanising Press speeds up quality production and cuts down costs by Preforming, in one machine, the operations of shaping, bagging, vulcanising and debagging. The five diagrams below illustrate the sequence of these operations.

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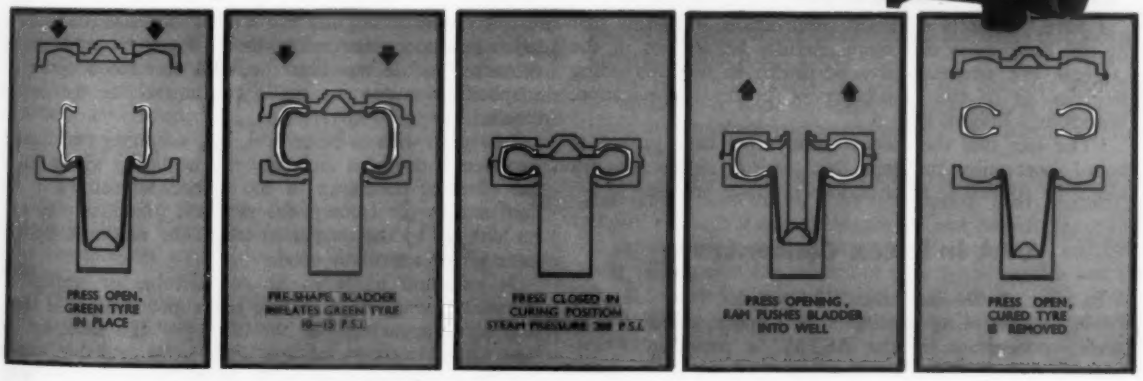
PRESS OPEN, GREEN TYRE IN PLACE
PRE-SHAPE, BLADDER INFLATES GREEN TYRE
PRESS CLOSED IN CURING POSITION
PRESS OPENING, RAM PUSHES BLADDER INTO WELL
PRESS OPEN, CURED TYRE REMOVED

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VIEWS and REVIEWS

Curing of Rubber Solutions

A PAPER in *Transactions of the Institution of the Rubber Industry* (1959, 35, No. 1, p. 1) on 'Ultra-Rapid Cold Vulcanization of Rubber Solutions,' by D. E. Woods and J. E. Roberts* is interesting.

It is scarcely necessary to dwell upon the 'cold cure' process in connexion with rubber or to the production of 'white factice'; indeed the application of sulphur monochloride as a vulcanizing agent—as the present authors point out—dates back to 1846, when it was discovered—and patented—by A. Parkes.

However, it is only within comparatively recent times (*cf. references* to present paper) that the change which occurs when the sulphur monochloride is applied to a rubber '*solution*' has been discussed by several workers, and this aspect is dealt with by Woods and Roberts in interesting fashion. They found that, in the presence of commercial organic accelerators, reaction times as short as 0.1 second were recorded.

Method

Certainly one of the major points of interest in the paper now quoted is a description by the authors of an ingenious apparatus devised by them and which has been used to measure accurately the vulcanization times of various types of rubber solution, using sulphur mono- and di-chlorides (*cf. original*).

Practical Application Adumbrated

I have purposely refrained from details as I think that in this case these can more usefully be studied in the original, but attention may be drawn to the concluding sentence as to the possibility of practical application. Woods and Roberts say:

'The fact that the vulcanization times have proved to be so short raises the hope that these or similar systems might be applied to a continuous proofing process.'

VFA in Latex Concentrate

In view of the fact that 'The volatile fatty acid test (VFA) is now being considered as a specification of first-grade concentrate by the ASTM' a paper in *Transactions, IRI* (1959, 35, No. 1, p. 10), by J. S. Lowe (Dunlop Research, Malaya) on the 'Formation of Volatile Fatty Acids in Ammonia-Preserved Natural Latex Concentrate,' is obviously of practical import.

I cannot do more here than reproduce, with very brief comment, the main conclusions reached by Mr Lowe in his comprehensive paper (which includes five graphs and a number of tables), but it seems to me relevant, to begin with, to quote the following passage from his introductory remarks:

'In 1953, Philpott and Sekar (*ref. to JRRIM* quoted) showed that volatile fatty acids such as acetic acid were principally instrumental in affecting the properties and quality of the latex concentrate, and that the short chain volatile fatty acids could be determined by steam distillation of the serum from acid coagulated latex.'

Conclusion

Lowe's overall conclusion is that the formation of volatile fatty acids in natural latex concentrate is a limited enzymic process influenced by (a) the quality of the field latex, the level of the bacterial population in the length of time they have been allowed to be viable in the latex; (b) the temperature variations of the latex before and after processing; (c) the amount of serum substrate available for the enzymic process; (d) the degree of inhibition exerted by the level of ammoniation, and (e) the reduction-oxidation potential of the latex.

The author's comment on these findings is that where field and factory procedures follow a set pattern, the first four factors will tend to be more or less constant. The subsequent production of VFA is then controlled by the redox potential of the latex. When, he (Lowe) adds, 'the latex reaches the consumer, the VFA will, in all probability, be of the order of 0.1.' A figure of this order or less is indicative of a good quality latex, but a full knowledge of the history of the latex is necessary for a proper interpretation of its VFA number. This is especially so if the latex is one not solely preserved with ammonia!

If I remember rightly the ASTM decision (to which a brief reference was made on this page comparatively recently) was to consider the VFA test for adoption as a specification for first-grade concentrate, as the author recalls.

I have no wish to be critical, but, assuming that further experience confirms his (*i.e.* the author's) views as to the effect of constancy of the procedural pattern in the field and in the factory, the practical inference may well be affected by the degree to which the market supply of latex is subject to variation.

Is variation likely to be considerable or negligible? Secondly, with regard to the redox potential, is it likely that a full knowledge of the history of the latex, and of its correct interpretation, are likely to be available, except for the benefit of those with a highly-developed system of scientific control?

Cohesive Energy Densities of Polymers

A paper on the 'Cohesive Energy Densities of Polymers' by G. M. Bristow and W. E. Watson (BRPRA), (off-printed from the *Transactions of the Faraday Society*, No. 431, vol. 54, Part 11,—November 1958—), in two parts, constitutes Publication No. 298 of the British Rubber Producers' Research Association.

Part I deals with the 'Cohesive Energy Densities of Rubbers by Swelling Measurements.' In this research the authors have made swelling measurements on vul-

* Ministry of Supply, Armament Research and Development Establishment, Fort Halstead, Kent

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **DR SCHIDROWITZ**

canized natural rubber and eight synthetic rubbers in a wide range of solvents, and have determined values of χ (or μ), the interaction parameter, derived by application of the Flory-Rehner theory.

From an analysis of the said values, the authors have been able to assign cohesive energy densities to the rubbers. They have also discussed the limitations on the assigned cohesive energy densities for the prediction of polymer + solvent behaviour.

Important Tables

This paper is largely theoretical and mathematical, and, as a whole, should mainly interest physicists and physical chemists. It is remarkable, *inter alia*, for a number of comprehensive tables. Thus, Table 1 covers more than 50 'Solubility Parameters[1] for Solvents at 250°C.' Table 2 gives details relating to the 'Swelling of Rubber Vulcanizates in (some 40) Solvents,' and Table 3 (*a full page of figures*) gives data relating to the swelling of two different synthetic rubbers in various solvents. Table 4 (*also a full page of figures*) gives data similar to those in Table 3, but relating to two other synthetics.

Materials

The NR used was a high-grade (Yellow Circle) smoked sheet. Data are given re the nature, etc., of the synthetic rubbers (*qv*). The NR was cured ('cross-linked') by incorporating 3% cumyl peroxide followed by heating in a mould for 50 minutes at 140°C. Other interesting data are given re methods of preparation, and processing relating to the various rubbers, method of estimating swelling, solubility, etc. Particulars re some of these matters are included in, or referred to (apart from the *tables*) in 4 graphs.

Part 2

Part 2 of the research deals with 'Cohesive Energy Densities from Viscosity Measurements.' The results of the research are summarized by Bristow and Watson as follows:

'Values are deduced for the interaction parameter χ for polymethyl methacrylate, polystyrene, and polyvinyl systems by an application of the Fox-Flory theory to the viscosities of a polymer fraction in a suitable range of solvents. Analysis of these values as in part 1 leads to the assignment of cohesive energy densities for the polymers. For natural and butyl rubbers it is shown that the analysis of viscosity and swelling measurements lead to identical values of cohesive energy density.'

Materials and Procedure

A few words indicating some relevant particulars may be given in exemplification. Thus the polystyrene was obtained by diluting redistilled styrene with an equal volume of benzene and then polymerizing by heating *in vacuo* with 0.25% of benzoyl peroxide for 12 hours. This was followed by fractionation. Polymethylmethacrylate was also obtained from the monomer and polymerized by benzoyl peroxide.

In the case of polyvinyl chloride the commercial polymer was purified by extraction and fractionation.

The viscosities at 25°C. were measured by means of Ubbelohde viscometers.

Further details and tables of results will be found in the original.

(1) One set of figures, namely, that relating to methylene iodide, had been previously estimated by Hildebrand (cf. ref. to Hildebrand and Scott, in the paper).

Notes

I have before me a 25-page, luxuriantly produced and illustrated brochure issued by the Phillips Petroleum Company*, entitled 'Phillips Rubber Research.' This is subdivided into sections headed Introduction; Polymerization Research; Pilot Plant Development, and Research Compounding and Technical Service. This publication is notable for many details relating to polymerization research technique, and to particulars connected with laboratory, pilot plant, and development in general bearing on the synthetic rubber industry, and ancillary subjects. Thus, on the introductory page there is a coloured illustration bearing the caption: 'Phillips' original synthetic rubber pilot plant, in use from 1944 to 1956,' and, it is mentioned, that this 'was the first plant in the United States equipped with refrigerated reactors capable of making "cold" rubber.' The details given (and illustrated) on laboratory and pilot plant research and development are particularly noteworthy.

PHILIP SCHIDROWITZ

* Also bears imprint '(c) Phillips Chemical Company, Bootlesville, Oklahoma, 1958,' on inside title page.

INDONESIAN TAKEOVER STANDSTILL

DR DJUANDA, Indonesian Prime Minister, has urged the Ministry of Agrarian Affairs in Medan against precipitate action towards taking over two British rubber estates pending further investigation, according to a Rubber Growers' Association spokesman.

He said Dr Djuanda had cabled the Ministry asking it to observe his standstill order on takeover of the estates until a committee had examined the problem of expired concessions.

The Serato and Sungei Pendjara estates of the Harrisons and Crosfield Group, were threatened with seizure on expiry of their leases on March 28 and March 31.

Britain made representations to Indonesia on February 23 against the seizure of two British estates and the threat of similar action against three others. The Namu Unngas and Kuala Tiga estates were taken over about a month ago.

Sir Leslie Fry, Britain's new Ambassador to Indonesia, discussed the problem with Dr Subandrio, Indonesian Foreign Minister, last week, but Foreign Office officials here declined comment on the subject.

It is understood that the third estate threatened originally with seizure—at Blankahan—had heard no more since then from the authorities.

World Output Down

On a world-wide basis only two major industrial groups, the food, beverage and tobacco industries, and the chemical, petroleum and coal products industry, increased their output in 1958 as compared with the previous year, according to the United Nations Statistical Yearbook 1958. HMSO. 46s.

Questions Corner—66

(Second Series)

283. What are the factors that influence the flow of a synthetic lacquer or paint?

284. Dibutyl phthalate is used extensively as a plasticizer for polyvinyl chloride and other plastics. Give some details.

285. Is it possible to prepare nitrocellulose lacquer emulsions, and for what purpose are they used?

286. In the production of cellulosic products alpha cellulose is used. What is this?

(Answers next week)

Answers to Questions Corner—65

279. The properties of cellulose acetate rayon are affected by the fact that the hydroxyl groups of the cellulose have been, in the main, esterified and therefore the fibre is less hydroscopic than viscose, and is less likely to swell or dissolve in organic solvents. Cellulose acetate is, nevertheless, hydrophilic.

Tenacity and elongation. — Cellulose acetate rayon has a tenacity of about 1.4 gm./denier, and an elongation at break of about 25% for the dry fibre. For the reason given above there will be less decrease in tenacity for the wet fibre than for viscose rayon. Tenacity is about 0.9gm./denier, with an elongation at break of about 35%.

Density.—This is very similar to that of wool at about 1.32.

Moisture regain. — Under standard conditions cellulose acetate has a moisture regain of about 6.5%.

Thermal.—Cellulose acetate is a thermoplastic material and therefore if the rayon is ironed with a very hot iron it first becomes sticky and finally the fibres will fuse.

Chemical.—Cold dilute acids and dilute alkali solutions do not affect cellulose acetate but it is attacked by cold concentrated acids and is saponified by strong alkalis. It is easily soluble in some organic solvents, *e.g.*, ketones, and swollen by others, *e.g.*, ethylene dichloride. It is not attacked by ether.

* * *

280. There are a number of non-resinous natural materials which have been used in the production of phenolic resins including rubber, lignins, tannins, proteins and various carbohydrates.

The addition of rubber to a phenol-formaldehyde plastic is obviously an attempt to increase the flexibility of the resin, or to improve the heat and solvent resistance. Several methods can be used to combine the two, *e.g.*, by mixing the rubber and the resin, in powder form, on conventional mixing machines, with the appropriate vulcanizing agents. Secondly, the rubber may be added to the unreacted, or partially reacted, phenolic resin, and it may be added in the form of a latex or water dispersion, or in an active solvent for both materials. The product may be vulcanized after the resin has been formed.

Another method is to mix the rubber in latex form with a water dispersion of the resin. Rubber modified phenolic resins are suggested for gaskets, packing, coatings and as adhesives for bonding metal to rubber.

Lignin is a plastic material which is obtained from wood, straw or bagasse. It may be formed into moulding materials as such, or mixed with phenol-formaldehyde resins. It can also be reacted with phenol to obtain novolak resins, which may be further reacted with aldehydes to give resols.

* * *

281. There are quite a number of polyvinyl ethers that are produced on a commercial scale including polyvinyl methyl ether, polyvinyl ethyl ether, polyvinyl n-butyl ether, etc. Polymerization is carried out in the presence of Friedel-Crafts type of catalyst. Probably the most familiar is polyvinyl methyl ether which is soluble in water and all organic solvents except naphtha. It is a sticky, yellow liquid with a specific viscosity of 0.5–0.9 (1gm./100c.c. benzene at 25°C.). The main use of this ether is for imparting tack to various adhesive formulations, cements and coatings. It acts as a non-migratory plasticizer to a number of resins and is resistant to leaching by water from such resins. It is insoluble in hot water.

The ether is compatible with a number of other materials such as natural rubber, neoprene, polystyrene, polyvinyl chloride–vinylidene chloride copolymers, vinyl chloride-acetate copolymers, phenolic resins, ethyl cellulose and nitrocellulose.

Polyvinyl isobutyl ether is remarkable for its electrical properties, plasticity and adhesiveness. It is soluble in a wide range of solvents. It is soluble in hydrocarbons, chlorinated hydrocarbons, esters, ethers, ketones and higher alcohols, with similar properties to that of the methyl ether.

* * *

282. Formaldehyde is used to a large extent with phenols to produce thermosetting resins, but other aldehydes may be used. The most commonly used include butyraldehyde, furfural, acetaldehyde and benzaldehyde. Resols, however, cannot be prepared, except in the case of furfural because with alkaline catalysts there is either no reaction at all or the aldehyde itself resinifies. Acid catalysts must be used which results in novolaks being formed which require a methylene-supplying agent for hardening. Hexamethylenetetramine is preferred.

Acetaldehyde-phenol novolaks are more fluid when hot, and when hexamine is used they do not cure so quickly as the phenolformaldehyde resins. In addition, acetaldehyde is more costly and this has not contributed to its development. These novolaks are soluble in drying oils and butyraldehyde and higher aldehydes are more so. Unfortunately the resulting resins are very dark in colour and this has limited their use.

When reacted with drying oils, *e.g.*, tung oil, the oil modified resins have been used as flexible materials for moulding round metallic inserts.

Furfural can itself polymerize or condense to resins in several different ways. On reacting with phenol a further increase in molecular size can occur after the initial condensation through polymerization.

Furfural is a solvent for most phenolic resins and the reaction mixtures are therefore homogeneous. They are used for the production of thermosetting moulding materials. They have a long flow and with slow curing rate at moderate temperatures. This is of considerable advantage when moulding intricate objects. At higher temperatures (ca. 200°C.) they cure quite rapidly and this characteristic makes them particularly useful for transfer moulding.

(More questions next week)

Polly Ester Says . . .

'A nervy gum is just as bad as toothache'

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MEN and MATTERS

A Review of People and Events

by George A. Greenwood

THERE was a very interesting social occasion, arranged by the Horners Company, at the New Livery Hall at Guildhall the other day, which took the form of the annual plastics lecture and dinner which has become by now an institution. After the company had dined, Mr Charles Waghorne spoke on the craft of the mould makers in plastics. Mr Waghorne who, as everybody knows, is so closely associated with Insulators Ltd., of Edmonton, famous as makers of moulds, brought with him a number of them to put on show, to illustrate what he had to say. There could scarcely have been a happier choice, indeed, either of speaker or subject. Mr Waghorne was, I believe, a founder-member of the British Plastics Federation, and is a past chairman and a past president, as well as being a Fellow of the Plastics Institute.

These social functions are also, of course, the occasion for the presentation of the annual awards, given through the Horners Company for the encouragement of craftsmanship in plastics, and decided by the nominees of the British Plastics Federation. As already announced, this year's winner who was suitably honoured, is Mr R. E. Facius, of BX Plastics, the two runners-up being Mr P. D. Durden and Mr A. P. Hickman, respectively of London and of Birmingham.

Activities in Indonesia

There was an upsurge of interest in plantation circles in the City, especially rubber, just before the holidays, at the news that, after the announcement a week or two before to the effect that the Indonesian Government had decided to nationalize more plantations, steps were then being taken to implement it. A brief message from Djakarta to the effect that a further 227 Dutch-owned plantations are to be made public property on terms undisclosed, 177 of them producing rubber or tea or both, has naturally set rumour and inquiry afoot as to what is going to happen to British-owned estates, but diligent inquiries, both in South-East Asia and in London, have failed to elicit any sort of firm information, and certainly nothing satisfactory. The emphasis is, of course, and has been since the long-drawn-out dispute between Holland and this part of South-East Asia, upon Dutch interests and possessions, and it will be recalled that in February, the Indonesian Government announced the nationalization of 38 Dutch tobacco estates, leaving the owners largely in the air as to how they were going to fare.

A more up-to-date statement from Djakarta says that 'the entire nationalization question is to be dealt with later.' Whether that means an extension of this process of take-over, to interests other than Dutch, British, Chinese and Indian, for example, is something which remains to be seen, but it is bound to increase disquiet among owners and investors, and also to damage the position of Indonesia itself in the matter of foreign investment. Who will want to risk money there under conditions so uncertain as these?

Those Octogenarians!

A well-known figure in industrial circles in the West Riding of Yorkshire, is Mr Frank Hardwick, of Heckmondwike, who has just celebrated his 80th birthday, and who is still, in those familiar words 'going strong.' He has had an unbroken record of 65 years with his company, Messrs A. Hardwick and Son Ltd., condenser rubber makers, which was founded by his father, and which he himself entered on leaving school at the age of 15. Now, after six and a half decades of service, he still goes to his factory five days a week, working a full day from 9 a.m. to 4.30 p.m., and when one of our mutual friends asked this worthy octogenarian if he did not think of retiring, Mr Hardwick replied: 'No sir, I am perfectly happy working, but in this matter of retirement, you can if you like, ask me again, in another 80 years' time.' That's the stuff to give 'em.

Mr C. H. Glassey (British Industrial Plastics), new president of the British Plastics Federation, presents the 1958 50-guinea Horners Award to Mr R. E. Facius (Halex Division, British Xylonite). The award, for an article to be made wholly or mainly in plastics material, was referred to in RJIP, February 28

A 'Safety' Postscript

Last week, an editorial note, under the heading 'Rubber Men's Safety,' referred to the value of rubber liferafts. Here is a postscript. Two workmen touched a rail which became 'live' because of a tear in a cable below the road. One wearing rubber boots got a shock, but escaped. The other, who wore hobnail boots, was killed. The verdict on the latter, at a Walthamstow inquest, was 'Accidental death.'

Mainly Personal

One of the most outstanding personalities in plastics and chemicals is Sir Miles Thomas, who appears so successfully to combine his duties as head of Monsanto with a variety of other absorptions. Not long before the holiday he was announced to be flying on business, mainly to the United States, but on inquiry I was told that 'We expect him to be back within a week.' It was almost at the same time that Sir Miles expanded his radio interests, introducing the new 'get ahead' television competition, and wrote about it as an introduction to the programme in the 'Radio Times.' Sir Miles said: 'I look forward with the liveliest anticipation to taking part in what clearly will be an exciting and valuable assessment of merits.' I am sure that vast numbers of viewers are sharing his enthusiasm.

Mr Norman K. Grover is a newcomer to the board of Kuala Kubu Rubber Estate, but in his case it is only a question of adding another sort of estate to his activities. He is a partner in Hillier Parker, May, and Rowden, the estate agents, auctioneers and surveyors.

At the Parish Church of Marton, near Middlesbrough, last week, the marriage took place of Mr John Saunders, son of Dr and Mrs F. W. Saunders, of The Grove, Marton, and Miss Carol Mellor of Chester, daughter of Mr and Mrs J. L. Mellor, of Salisbury, Southern Rhodesia. The bridegroom's father is chairman of the Billingham Division (heavy organic chemicals) of I.C.I., and he himself is on the staff of I.C.I., at Hillhouse, near Southport. Dr Peter Holroyd, who was his best man, has also family and personal associations with it.

New Bakelite Director

It is announced that Mr C. A. Robb, control manager, has been appointed a director of Bakelite Ltd. Mr Alex Mackenzie (USA) has retired from the board, and Mr B. T. Burgoyne (USA) has been appointed in his place.

It has been announced that the Oldhouse Estate at Ewhurst, in Surrey, for many years the home of the late Sir Eric Miller, chairman of Harrisons and Crosfield Ltd., is for sale, and this has apparently given rise to some misunderstanding. It will be recalled that Sir Eric left the fine house of Tudor character on the estate to the company for the benefit of the staff, and some people have assumed that the mansion, too, is now to be disposed of. This, I am told, is quite wrong. It is the estate itself, 150 acres, mainly of woodland, that is being disposed of.

IRI Golfing Society

LONDON SECTION SPRING MEETING

THE Spring weekend of the London Section of the IRI Golfing Society was held at Aldeburgh, Suffolk, recently.

This is the first time the London Section had visited the course and one of the reasons for going there was to find out its suitability as the venue for the final of the Wallwork Cup in 1960. The course is a first-class one and the Club House amenities leave nothing to be desired. A possible difficulty might be housing all the members in one hotel, but naturally this would depend on the number present.

The weekend was quite an informal one and on Saturday morning a four-ball competition was won by the secretary of the London Section, Joe Ruffell in partnership with Roy Cuzner. Friendly games were played on Saturday afternoon and, owing to weather conditions, a late start was made on Sunday morning when a Stableford Single was played. The best score was returned by Joe Ruffell.

Highlight of the weekend was the presence of our president, Mr Howard Franklin, at lunch on Sunday, accompanied by his son, Pat Franklin. Our vice-captain, Mr Denzil Davies, in the absence of Mr Val Jorey, our captain, expressed the pleasure which the members felt at being honoured by Mr Howard Franklin's company, and the latter responded suitably.

Prizes for the weekend were given by Ian Keith and Roy Cuzner.

—H.R.C.

Howard Franklin, president of the IRI Golfing Society, with Denzil Davies (*left*) **and Wilfrid Smith** (*right*)

'LUBRITHENE' CONCRETE INTERLAY

British Cellophane Ltd. have introduced a solid lubricant, only .003in. thick, and giving a coefficient of friction, between raft and base, of less than 0.25. This membrane, with the name 'Lubrithene,' greatly reduces base restraint, the manufacturers claim, making possible revolutionary improvements and economies in concrete laying. One of the main difficulties in concrete raft construction is the presence of crack causing stresses set up by high and irregular sub-grade or base restraint of inherent or induced movement in the raft. This problem is particularly serious in the early stages of setting when the concrete is in its weakest state and is contracting over the asperities of the base.

When 'Lubrithene' is interposed between raft and base, the coefficient of friction between them is reduced to less than 0.25. This compares with a coefficient of 0.75 when polythene film is used and up to 1.5 when paper is used.

The main application of 'Lubrithene' is in the construction of aircraft runways, roads, and similar long expanses of concrete.

'Lubrithene' is supplied in rolls 5ft. 3in. and 5ft. 9in. wide and 1,500ft. long. Special widths can be made to order. 'Lubrithene' costs 11.75d. per yd. delivered to site UK.

NCRT Residential Courses

Two ten-day residential courses of lectures and practical exercises on 'the Fundamentals of Polymerization Processes,' and 'Basic Rubber Technology for Sales, Buying, Costing and Planning Staff,' are to be held at the National College of Rubber Technology, Holloway Road, London, N.7, from July 6—15 inclusive. Students will be accommodated at Carleton Grange, the Hall of Residence of the College. Accommodation on the course is limited and early application is desirable. Further details can be obtained from the head of the College.

Mr F. M. Richardson has been elected chairman of Chipatoojah Java Rubber Co. Selected Plantation and General Securities Investment Trust, which earlier this month declared its offer unconditional, has been appointed as secretaries. The remaining directors, Mr C. W. A. Murray, Mr F. C. Elliott and Mr H. G. F. Davis have resigned as well as the secretaries, Arnold and Murray.

COMPANY MEETING

Anchor Chemical

SALES STEADILY MAINTAINED

Mr Thomas Martin's Review

THE 52nd annual general meeting of the Anchor Chemical Co. Ltd., was held on March 31 at Clayton, Manchester, Mr Thomas Martin, F.I.R.I. chairman, presiding.

The following is his circulated statement for the year ended November 30 1958:

I have pleasure in presenting to you the Directors' report and accounts for the year ended 30th November 1958. The group trading profit before taxation is £140,413 (which includes an exceptional non-recurring dividend of £7,350 received from an associated company), an increase of £17,961 over the previous year. The group trading profit after taxation is £72,348 (£55,545) and of that sum £69,621 (£52,984) is attributable to our Company. After adding £104,728 (£101,500) for unappropriated profits brought forward and deducting £10,350 for dividends already paid there is a disposable balance of £163,999 (£144,134).

The Directors propose that £25,000 should be allocated to general reserve (making total £100,000), that the final ordinary dividend be maintained at 12½% (less income tax) making a total of 17½% for the year and that the balance of unappropriated profit of £119,593 (£104,728) be carried forward.

Satisfactory Liquid Position

Reference to the consolidated balance sheet shows a further increase in our outlay in fixed assets. Current assets were £983,989 (£847,450) as against current liabilities of £529,444 (£425,304) showing our satisfactory liquid position is being maintained. The total of issued share capital plus reserves has increased by £42,844 to £613,522 which represents the shareholders' real capital employed in the business.

When we last met I mentioned our level of trading at that time was being maintained in spite of the conditions existing. Actually, we were in an atmosphere of restrictive measures arising from the sterling crisis, poor American trade reports, and low world commodity prices. Fortunately, by the Spring there were signs of more activity and by Summer the liberalization of the Banks' lending policy, modification of restrictions on hire purchase, and the improvement in the American trading situation gave a better outlook. Our own sales continued steadily throughout the year and finally finished approximately as last year, just over five and a quarter millions sterling. This is particularly noteworthy because, in some instances, selling prices have had to be reduced to meet competition and we have, therefore, had to sell more to maintain our turnover.

Continued Competition

Competition in the carbon black industry continues, primarily due to erection of additional units in many parts of the world, but our sales have been substantially maintained. We are looking forward to dealing with increased production. The hopes expressed previously for increased business in curing agents for synthetic resins have not been in vain and our sales are almost double those of the previous year. The enlargement of the Latex and Dispersions Department is almost completed and this will enable us to expand our activities in this field. Further units have come into production in our Development Plant, as forecast, and it is interesting to observe that since its inception in 1954 the annual tonnage manufactured has almost trebled thus making a contribution to the increased profit. We are developing successfully the sale of an American high impact thermoplastic resin and were so satisfied with its qualities that we sent a technologist to the USA to gain first hand experience and thereby enable us to offer it more efficiently to the numerous manufacturers who are likely to be interested.

As manufacturers and distributors of chemicals used primarily in the processing and fabrication of natural and synthetic rubbers and other elastomeric polymers we are confronted with an increasing number of commercially available elastomers. The compounding of these, in many cases, becomes a matter of complete revision rather than of simple substitution and accordingly our various laboratories (chemical and physical testing, service and research) are being pushed to the utmost. We have constantly in mind that scientific achievement, specialized knowledge and high standards of workmanship, allied with a large output of materials saleable at competitive prices, are essential in the conduct of our business.

Exports

As this country imports much of its food and many of its raw materials it is essential that exports occupy an important place in its activities. When you realize there is very little the United Kingdom can export which cannot be supplied by our competitors in other countries, it becomes increasingly apparent that we have to rely upon efficiency and ingenuity. The question of the European Common Market is uppermost in many people's minds and, by one means or another, this country must find a way to participate, otherwise we shall be excluded from an integrated industrial area of over one hundred and fifty million people, possessed of substantial raw materials and agriculture. Bearing all this in mind, we continue our own efforts to expand in the markets of the world and we are glad to say our export sales last year were increased; this again means more than is shown by the figures because competition overseas is extraordinarily keen and selling prices have had to be trimmed very much in order to secure business. Our Export Director and his assistants have, within the last three years, visited all the countries of Europe as well as the principal ones in South America and the Union of South Africa. Trade with Eastern Europe and the Soviet Union is also being developed and there have been two commercial and technical visits paid at high level to these territories with the result that some business has been transacted.

British Anchor Chemical Corporation in New York continue their very valued support and activity and are a tower of strength in helping us to maintain good relations with important manufacturers whose interests we represent. They also keep us posted with the trend of events and are ready to offer help to our friends in all parts of the world.

Most of you will have read from the papers that in June last, I relinquished the office of Managing Director and I thought you might like to know that I did this primarily because I came to the conclusion it was time a younger man took over these onerous and exacting duties. We all wish Mr. Savaage the best of health to enable him to fulfil the functions of his new office.

Outlook for 1959

With regard to prospects in 1959, it is becoming more and more difficult to forecast in view of the competition which is coming from increasing sources, but I am able to say that our general level of activity is being maintained.

The Directors appreciate very much the continued valued help received from the personnel who form various Committees and Panels. All the welfare schemes referred to in the past are still in force and the Anchor Social Club with its many amenities is as active as ever. I would like to mention our long service awards because since their inception in 1952 no less than twenty-seven employees (twenty-four men and three women) have each completed twenty-five years' service and qualified for recognition and eleven of them (ten men and one woman) have completed thirty-five years' and qualified for further recognition.

To all those who have in any way helped in this successful year the Directors tender their very best thanks.

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Plantation Commentary

by our Malayan Correspondent

THERE was an interesting comment from Sir John Hay, the managing director of Guthrie and Co. Ltd., on Russian buying, speaking here during one of his periodical visits to Malaya. He said that he did not think that Russia was buying rubber to create a stockpile to use against producing countries at a later date, but was buying for her own requirements. 'I should not say that there is any sinister motive or intention behind Russian buying,' he said. 'In many ways I think that Russian buying should be welcomed. It is trade and luckily Malaya is in a happy position to be able to supply Russia with a commodity she needs.'

On the future of natural rubber, Sir John said that the opening of new plantations and equipping them was a costly business and involved a wait of nearly a decade before any considerable revenue was forthcoming. 'This is not now considered a very attractive proposition for new investment,' he said. 'Malaya's productive capacity will be increased by such methods as replacing old seedling rubber with high-yielding stock and by expansion and additions to existing plantations and organizations.' It was likely that Malaya would, within a comparatively short time, become the biggest rubber-producing territory in the world and he saw no reason to suppose that in the near future there would be any significant decline in the price.

Some synthetic plants were operating only at part capacity and were finding it hard to make much, if any, profit at the fixed price of US23 cents a lb. 'I believe that the outlook for natural rubber is good, but it should not induce complacency,' he said. Sir John believes that production research should go on intensively and the rubber industry's security should be firmly based on efficiency without the doubtful reliance of artificial support schemes which are sometimes innocently called 'stabilization.' He considered that synthetic rubber is exerting a stabilizing influence on natural rubber and there is therefore no need to believe that under normal economic conditions rubber will show violent signs of fluctuating. The Malayan Government, of course, is keen on making an attempt to stabilize the rubber price and Sir John's comments should give food for thought. Sir John also had some frank comments on Malaya's efforts to promote more investment.

'Unhappily, Malaya is not, generally speaking, regarded in the City of London as an attractive field for the investment of overseas capital,' he said. 'Such investments as have been made have, for the most part, been influenced by those who are already established in Malaya or who have close associations with this country.' He felt that there was a need for Malaya to have its own Government official in London who could concentrate entirely on encouraging the flow of capital. He suggested that there might also be an advisory committee of six or eight Britons who knew Malaya and who could give advice. There would be no difficulty in forming such a committee which could meet informally and could keep the official in close touch with controlling capital in the City.

'Your High Commissioner naturally moves in diplomatic circles and what is needed is someone to create contacts with the economic interests of the City of London itself,' he said. 'This official would also be able to reflect the temper and the moods of the City. The feeling in London was good towards Malaya, but in order to get more capital into Malaya you must stimulate it.'

Just what effect the new rubber wage agreement will have on the production costs of rubber and production in general is still not clear after the signing of the long-awaited agreement and may not be so until some time after the agreement comes into force on June 1. The signing of the agreement was something of an event in the history of industrial negotiations in Malaya for the talks lasted for 13 months and at one stage degenerated into a series of lightning strikes which were only stopped after the employers had firmly refused to negotiate under the threat of strikes.

The union, the National Union of Plantation Workers, went into the negotiations after cancelling the previous wage agreement with the intention of negotiating not only an increase but a new wage structure. They wanted the wages paid to the worker to be taken off a sliding scale which depended on the price of rubber so that wages rose and fell with the market. They wanted instead a guaranteed minimum wage with a prosperity factor added that would depend on the rubber price. The demand is related to a general move among the unions in Malaya for guaranteed minimum wages and a national minimum.

The employers, apart from their natural concern not to pay out too much in wages, wanted some arrangement which will increase productivity at a time when production costs mean a great deal and when competition with synthetic may well make price a vital factor. Wages are 60 to 70% of the cost of producing rubber. Some of the union's demands were quite unrealistic in present conditions in Malaya. Originally they demanded a wage of $6.40 a day (about 15s.), plus a bonus for scrap for tappers and also various other additions. This was more than twice the wage agreed to at that time and in the most unlikely event of it being agreed would have produced an unwelcome effect throughout Malaya's economy. There were also other wage demands for the other workers and a demand for 21 paid holidays a year for all.

The agreement now reached is a complicated one. There is a guaranteed basic wage of $2.40 a lb. when the price is between 60 and 70 cents a lb. (Malayan) and this will rise by 14 cents for every 10 cents increase in the price paid for rubber. In addition to the basic wages there are cost of living allowances and an extra allowance for the 'price' or 'prosperity' factor. The point which pleases the union is that this basic wage will be paid irrespective of the amount of latex brought in. There is also incentive pay which, under this arrangement, will enable the hard workers to do more and get more, and there will be payment for bringing in scrap.

The new agreement will mean making fairly radical changes on estates and the period until June has been allowed to enable estate managers and union officials to explain what it means after working out the implications themselves. Negotiations for a fresh agreement can be started after a year, which unfortunately does not seem to offer too much hope of prolonged stability in the industry.

Prime Minister's Resignation

The resignation of the Prime Minister, Tengku Abdul Rahman, was a profound shock to people here for it had been one of the best-kept secrets of this Government. Both in Malaya and overseas the Prime Minister had been looked on as an important stabilizing influence and the only man, when it comes to the pinch, able to talk to all communities and all classes frankly, honestly and with a sincerity that has never been seriously doubted. He has been a strong supporter of developing Malaya's industrial potential by inviting overseas participation and in general in curbing the few who feel that independence should mean the Malayanization of everything in sight and such unusual measures as the banning of Western style dancing and the sale of alcohol.

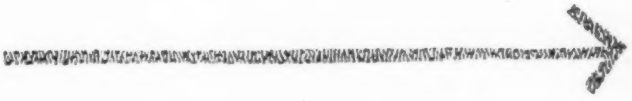
They have had no encouragement from the Prime Minister and are representative of no more than a fringe of well meaning but completely insignificant do-gooders.

There was never any suggestion, however, that the Prime Minister had disagreed with his Cabinet or lost the confidence of his party, and first guesses were that he was feeling tired and needed a rest. Although this is not one of the reasons the Prime Minister

A Question For Every Rubber Compounder . . .

What is 'FORTAFIL' ?

The answer is on page 523



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has since given, it may well play a part, for the Tengku has had to bear an exceptionally heavy burden and has often taken on to his own shoulders work that should have been done elsewhere. He has looked tired and has suffered minor but distressing complaints lately. It will do no harm for others to handle their own affairs without consulting the Prime Minister at every turn.

Explaining his own reasons for resigning now six months before the next General Election, the Prime Minister (he will be Prime Minister until the middle of April when he finishes his 'leave') said that he felt the need to try and reorganize his own party, the Alliance Party.

The party is made up of three communal organizations which still exist separately, representing the Malays, the Chinese and the Indians, but which have allied in the party and agreed to sink their communal differences. It has worked surprisingly well, but of late there have been signs that an overhaul is needed. Tengku Abdul Rahman is probably right in believing that he is the best man to do it.

His main message will obviously be to tell everyone once more that they must not think along communal lines, despite the fact that some of the somewhat puny opposition parties may well try to raise communal issues at the elections. It is a constant danger in a country of many communities and a too-easily-grasped temptation for a politician to make these issues an election point. Tengku must ensure that the mass of his supporters can face issues like this unshaken.

It should not prove too difficult for him, but the other task may be potentially more troublesome for he has decided personally to arbitrate on the selection of the party's candidates in the 11 State elections which will be held, starting in April, and the Federal elections expected in August. There is no doubt that the Alliance will win again and so the Prime Minister has said that he intends that only good men should be elected who will be capable of running the country properly in the crucial four years of development ahead.

In a farewell broadcast he referred to the point that Malaya had a good reputation overseas and that he intended things to stay that way.

Some of those elected in 1955 to the Federal Legislative Council have not visited their constituencies since, while one or two leaders in the Alliance who might be expected to be nominated again have not shown the Alliance spirit of compromise on communal issues. The Prime Minister has made it clear that they need not expect renomination.

Dato Abdul Razak will take over from Tengku Abdul Rahman and he is one of the ablest administrators in Malaya. His firm measures with the Communists and with subversion have given him a well-earned reputation for being one of the strong men of the present Government. At 36 he is one of the youngest members of the Cabinet but he has always been a statesmanlike adviser to the Tengku and has been responsible for adding many a dash of practicability to some of the Tengku's more ambitious schemes.

Tariff Protection

The Ministry of Commerce and Industry is in difficulties again with the Malayan Rubber Goods Manufacturers' Association, this time over the continued existence of bicycle tyre and bicycle tube factories in Malaya. In a strongly worded letter the association, which has heavily criticized the Ministry in the past, has demanded immediate tariff protection for the industry or warned that in a few weeks' time the remaining factories will have to close down. It has argued in the past that overseas competition has brought the demise of other tyre factories in Malaya and now warns that the remaining ones may have to close. The association alleged that there had been a lack of interest in the past in the needs of the industry.

They hope to send a delegation to meet the Minister and 'enlighten' him on the difficulties of the industry. Commenting on a statement from the Ministry that the manufacturers should show that there had been foreign dumping before demanding protection, a spokesman for the association pointed to the ban which had been placed on textiles from Communist China.

He said that the Ministry had decided then after investigation that there had been dumping of cheap textiles in Malaya from Communist China and called on the Ministry to investigate the import of bicycle tyres and tubes.

Production

December's production of rubber in Malaya was a record, 71,676 tons largely because of dry weather, the fact that replanting is now beginning to make itself felt in production statistics and because the smallholders, whose enthusiasm is apt to vary with the price of rubber, were encouraged by the good price for rubber to tap trees rather than neglect them.

A fair proportion of this record production will, of course, go to Russia, still a heavy buyer in the Singapore market. Dealers in Singapore report, however, that Russia is now turning to the lower grades, which she is using with synthetic rubber in tyre production. This has produced the better price for lower grade rubber which encouraged the Malayan smallholder.

There is still no definite indication that Russia is buying for Communist China but it seems likely in view of the fact that Peking has stopped buying direct from Malaya.

North British Appointment

The North British Rubber Company announce two sales appointments, as from March 23. Mr P. Cook, previously with Lotus, Stafford, and Derham Bros., Bristol, takes up an appointment with direct responsibility for leading multiple accounts.

Mr Glyn T. Jones, formerly with Normans Ltd., London, a former treasurer and secretary of the Shoe Retailers Association of South Wales, becomes regional representative in that area.

Both these newcomers to The North British organization are already well known in the footwear industry.

ITS Rubber Ltd.

The name of the Itshide Rubber Co. Ltd., Petersfield, Hants., has been changed to ITS Rubber Ltd. The company is thus reverting to the name under which it was established 40 years ago. The name ITS is better known and more widely used in the industry, and its use will, the company states, fit in more satisfactorily with future marketing and advertising plans.

Dr I. Kemp, who has been chief chemist for Revertex for many years, has been appointed to the board as technical director.

Cougar grain PVC is being used for seating in the new Consul saloon manufactured by the Ford Motor Co. Ltd., Dagenham. The material is supplied to Fords by Bernard Wandle (Everflex) Ltd., Caernarvon

'Fortafil' *A 70 is I.C.I's trade name for its NEW reinforcing filler, now available to the rubber industry.*

But what's different about **'FORTAFIL'**?

See page 525

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Rubber Statistics

JAPAN — CEYLON

THE International Rubber Study Group's latest Bulletin gives details of the Japanese rubber position at the end of October.

Imports of natural rubber amounted to 104,335 tons, and consisted of 96,168 tons of crude rubber and 8,167 tons of latex. This represented a reduction of 8,000 tons or some 7% compared with the corresponding 1957 total. Malaya supplied 90,815 tons of the 1958 imports, while Indonesia sent 4,169 tons, Ceylon 4,338 tons, British Borneo 4,652 tons and other countries the balance of 361 tons.

Consumption of natural rubber during these months amounted to 103,830 tons, compared with the corresponding 1957 consumption total of 111,080 tons. Consumption of crude rubber went down from 104,300 tons to 95,560 tons, but consumption of latex rose from 6,780 tons to 8,270 tons. Stocks of natural rubber on hand, which had totalled 12,420 tons of crude and 1,410 tons of latex at the beginning of the year, stood at 13,028 tons of crude and 1,305 tons of latex at October 31.

During these ten months, Japan also imported 13,208 tons of synthetic rubber, taking 10,170 tons from the USA and 2,435 tons from Canada; this was some 1,300 tons more than the corresponding amount for 1957, when 9,495 tons were received from the USA and 2,433 tons from Canada. Consumption of synthetic totalled 13,280 tons as against 10,890 tons in the earlier period, and stocks of synthetic at the end of the period stood at 2,798 tons, being at almost the same level as at the beginning of the year, when they stood at 2,870 tons.

Ceylon

The latest statistics issued in Colombo show that during the month of January, 7,703 tons of rubber were produced on estates, including 4,074 tons of sheet rubber, 103 tons of sole crepe, 533 tons of scrap crepe, 2,890 tons of latex crepe and 103 tons of latex. In addition 1,363 tons of rubber were produced on smallholdings, making 9,066 tons in all for the month, as compared with the December production total of 11,267 tons, and that for the previous January of 9,853 tons.

Exports of rubber from Ceylon during January totalled 6,426 tons, compared with the December figure of 7,162 tons, and included 2,299 tons of sheet rubber, 59 tons of sole crepe, 2,092 tons of scrap crepe, 1,917 tons of latex crepe and 60 tons of latex.

Consumption of rubber inside Ceylon amounted to 409 tons, including 383 tons of sheet rubber and 26 tons of latex, and stocks at the end of January stood at the relatively high figure of 47,212 tons or more than five times the January production total. Of this amount, 28,203 tons were in the hands of producers, 5,873 tons were held by dealers, 650 tons by manufacturers, 321 tons by the Government and 12,165 tons by shippers.

Singapore Brokers

The Singapore Rubber Brokers' Association, formed last year after its predecessor had been dissolved in 1957, has been no more effective in controlling members, the chairman of the Singapore Chamber of Commerce Rubber Association, Mr E. G. Mortensen, told the annual meeting recently. Brokerage rates agreed between the SCCRA and the brokers' association were now largely nominal.

Rubber Crop Returns

HARRISONS AND CROSFIELD LTD.

	February 1959 lb.		No. of mths. of fin. year to date	Fin. year to date lb.	
Sumatra					
Allied Sumatra	718,699	(762,010)	2	1,596,350	(1,696,760)
Asahan	108,026	(119,048)	7	857,590	(972,228)
Bah Lias	154,322	(209,437)	4	667,994	(888,454)
Central Sumatra	85,979	(88,184)	8	741,847	(839,952)
Lankat Rubber	57,320	(60,627)	11	684,970	(685,631)
Mendaris	189,596	(182,982)	2	405,647	(397,498)
Sialang	187,391	(186,730)	1	187,391	(186,730)
Soengei Rampah	50,706	(52,911)	2	108,026	(116,845)
Tanah Datar	66,138	(74,956)	2	147,708	(159,833)
Tandjong	143,299	(126,487)	8	1,216,877	(1,160,084)
Toerangie	187,391	(213,846)	4	857,589	(914,909)
United Lankat	25,904	(29,762)	2	57,650	(61,729)
United Serdang	772,712	(951,505)	6	5,673,758	(6,416,488)
Malaya and Borneo					
Castlefield	199,500	(192,000)	8	1,879,500	(1,697,000)
Golden Hope	647,500*	(603,100)	12	7,919,500*	(7,499,200)
Holyrood	62,500	(59,000)	2	143,500	(130,500)
Hongkong	26,000	(19,500)	2	55,200	(40,300)
Hoscote	225,000	(215,500)	8	1,968,900	(1,912,900)
Killinghall	44,500	(35,500)	8	350,600	(293,800)
Kuala Selangor	56,000	(43,000)	2	116,000	(95,000)
Kulai	185,000	(133,500)	4	812,000	(585,500)
Lanadron	346,700	(358,500)	2	801,700	(760,100)
London Asiatic	1,331,000	(1,252,000)	2	3,001,000	(2,703,000)
Malaysia	41,500	(57,500)	2	99,500	(134,500)
New Crocodile	216,500	(233,500)	12	2,865,500	(2,535,500)
Pataling	984,500	(842,500)	4	4,759,500	(3,906,000)
Prang Besar	198,600†	(166,900)	11	2,100,800†	(1,790,300)
Sandac	81,000	(76,000)	11	836,000	(804,000)
Sapong	137,000	(114,000)	2	282,000	(269,000)
Seaport	69,000	(70,000)	8	634,000	(638,000)
Strathisla	83,000	(77,000)	8	858,000	(717,000)

* Includes Klanang Bahru Estate crop from January 1 1959.
† Includes Bukit Prang Estate crop from January 1 1959.

South India and Ceylon					
Malayalam	1,500	(6,900)	11	6,700,200	(6,572,400)
Lunuva	93,872	(104,546)	2	227,444	(249,204)

SHARPE, ESTALL AND CO. LTD.

	Fin. year ends	Feb. 1959 lb.		Fin. year to date lb.	
Anglo-Johore	July	67,600	(51,660)	432,900	(349,460)
Batang	March	66,232	(79,000)	925,496	(779,000)
Bekoh	March	169,000	(167,000)	2,219,000	(1,858,000)
KPRP	March	62,000	(60,000)	597,200	(505,300)
Rim (Malacca)	June	181,000	(159,000)	1,805,500	(1,460,200)
Sittang Valley	June	109,520	(115,130)	886,690	(1,019,330)
Kurunegala Rubber	Dec.	22,230	(31,160)	49,955	(63,630)

	January 1959 lb.		No. of mths. of fin. year to date	Fin. year to date lb.	
Sedenak	140,000	(138,000)	4	769,000	(726,000)

	February 1959 lb.		No. of mths. of fin. year to date	Fin. year to date lb.	
Mengkibol	77,000	(70,000)	2	165,000	(149,000)
Malaya General	181,000	(140,000)	6	1,281,000	(979,000)

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PATENT SPECIFICATIONS

The following information is prepared from published Patent Specifications. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 3s. 6d. per copy (including postage).

Polythene

No. 808,286. Deutsche Gold- und Silber-Scheideanstalt vormals Roessler. Application and Filed, December 29 1955. Application in Germany, January 12 1955. Published, February 4 1959.

The properties of films and other shaped bodies of polythene are improved by incorporating in the polythene one or more finely divided oxides of a metal or non-metal of groups 2, 3 or 4 of the Periodic System and stretching the shaped polythene beyond its elastic limit. The oxides are obtained by reaction of a volatile compound of the metal or non-metal in the vapour or gaseous phase in the presence of an oxidizing and/or hydrolysing gas, aluminium oxide and silica being the oxides used in the examples.

Polythene Filaments

No. 807,248. The Dow Chemical Co. Inventors: A. T. Widiger and T. L. Hendershott. Application and Filed, January 15 1957. Published, January 14 1959.

A multifilament strand of polythene or other polyolefin is made by extruding the polyolefin through a multihole die, surface chilling the freshly extruded filaments by means of a blast of air and then quenching the filaments, while they are still hot, at a temperature of 55° to 5°C. below the melting temperature of the polyolefin, the filaments being stretched to a length of up to ten times their original length during the quenching process. Preferably boiling water is used to quench the filaments. The process is particularly intended for the extrusion of polythene of molecular weight between 40,000 and 120,000 as prepared by the Ziegler low-pressure process. Polythene prepared in this manner is referred to in the Specification as an 'ultrathene' to distinguish it from polythene prepared by the high-pressure process.

Lining Metal Pipes with a Thermoplastic Synthetic Resin

No. 807,413. Tubovit Societa per Azioni. Application and Filed, June 26 1956. Application in Italy, June 27 1955 and April 12 1956. Published, January 14 1959.

In a process for lining metal pipes with PVC or other thermoplastic synthetic resin, the PVC is first formed into a tube having an outer diameter greater than the inner diameter of the metal pipe. The PVC tube is then heated to a temperature at which it undergoes deformations which may be temporarily set by cooling but are substantially eliminated by subsequent heat treatment, and while the tube is hot, it is passed through a die having an inner diameter smaller than the inner diameter of the metal pipe. The PVC tube is then rapidly cooled and passed into the metal pipe, the assembly being subsequently heated to cause the PVC tube to revert to as near to its original diameter as the metal pipe will permit, and so form a tightly fitting lining to the metal pipe.

Shorter Abstracts

Factice. 806,408. C. B. Featherstone and C. F. Flint. Filed, October 10 1956.—Unsaturated saponifiable oils of iodine value exceeding 140, which are not normally suitable for the preparation of factice, are rendered suitable for this purpose by reacting the oils with styrene monomer. The styrenated oils thus obtained are then converted into factice by heating with sulphur in the usual way.

Lignin-reinforced Rubber. 806,712. United States Rubber Co. Filed, December 31 1956.—A polyisocyanate is mixed into a dry lignin-rubber masterbatch which has been prepared from a mixture of lignin and natural or synthetic rubber latex. The addition of a polyisocyanate results in improved physical properties of the vulcanizate, especially higher abrasion resistance and reduced torsional hysteresis.

Plastics Statistics

FEBRUARY IMPORTS AND EXPORTS

ACCORDING to the official Trade and Navigation Accounts for February, UK imports of plastics materials during the month amounted to 3,221 tons, compared with 3,485 tons in February 1958. The values were £1,281,365 and £1,428,550, respectively. The major source was the US which sent 1,327 tons, worth £596,436, compared with 957 tons, worth £503,656 in the corresponding period of last year.

Exports of plastics materials during February totalled 11,475 tons, valued at £2,918,971, and compared with 9,126 tons, valued at £2,460,036. The Netherlands took 745 tons, worth £197,505; France, 686 tons, £188,701; India, 610 tons, £147,175; Hong Kong, 607 tons, £134,497; and Australia, 605 tons, £270,349.

Details of imports of plastics materials during February are as follow:

	Tons	£
Alkyd solid and liquid resins, solutions, emulsions and dispersions	134	28,326
Cellulose plastics:		
Photographic (including cinematograph) film base (except acetate butyrate)	156	185,935
All other	166	132,736
Polyvinyl chloride:		
Polymers and copolymers	532	109,286
All other	319	124,439
All other	1,912	700,643
Total	3,221	1,281,365

Exports of plastics materials in February, with values, were as follow:

	Tons	£
Acrylic sheet, rod, tube, film, foil and profile shapes in primary form	417	249,462
Aminoplastics:		
Solid and liquid resins, including solutions	851	96,923
Moulding and extrusion compounds	458	83,913
Cellulose plastics:		
Moulding and extrusion compounds	246	69,932
Sheet, rod, tube, film (excluding regenerated cellulose), foil and profile shapes in primary form	54	37,085
Phenolics and cresylics:		
Solid and liquid resins (straight and modified)	570	139,813
Other	398	169,417
Polystyrene	1,010	223,679
Polythene sheet, rod, tube, film, foil and profile shapes in primary form	259	98,112
Polyvinyl chloride:		
Polymers and copolymers	851	130,689
Moulding and extrusion compounds	673	156,094
Sheet	496	214,393
Other	157	27,851
All other	4,044	1,118,586
Waste and scrap	985	103,022
Total	11,475	2,918,971

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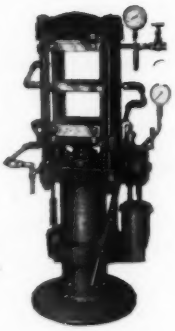
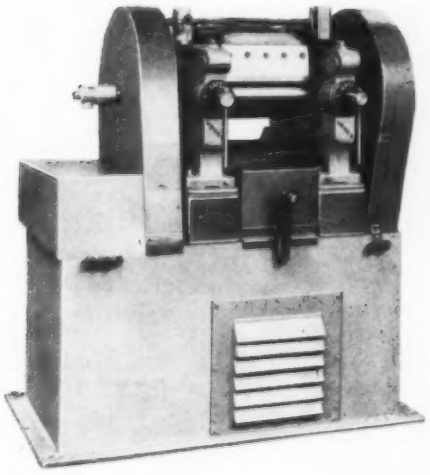


The illustration on the left represents: Steam-heated 2-daylight 12½/25 Ton Press.

On the right:— Double Geared Motor Driven 2-speed Laboratory Mill.



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Synthetic Rubber Prices

Prices of synthetic rubbers appear regularly in RUBBER JOURNAL AND INTERNATIONAL PLASTICS *in the first week of each month. It will be appreciated if suppliers will give notification of any price changes or additions to their range. Cif duty paid quotations are subject to slight variation due to exchange, ocean freight and insurance fluctuations. Prices are in pence per lb., except where otherwise stated.*

(e-qdp)—Ex-quay duty paid (cifUKdp)—cif UK duty paid (ddp)—Delivered duty paid
(e-sUK)—Ex-store UK (ex-wUK)—Ex-warehouse UK (d)—Delivered

SBR TYPES AND HIGH-STYRENE RUBBER

Ameripol (Goodrich Gulf) (min., 70,000-lb. lots)	(e-qdp)
1000 Hot, Non-Oil	23.10
1001 „ „	23.10
1002 „ „	23.34
1006 „ „	23.34
1007 „ „	23.34
1009 „ „	23.71
1011 „ „	23.71
1012 „ „	23.24
1013 „ „	23.94
1500 Cold, Non-Oil	23.10
1501 „ „	23.10
1502 „ „	23.10
1703 Cold, Oil-Extended, 25% oil	*20.31
1705 „ „ „ „	*20.07
1707 „ „ 37.5% oil	*18.89
1708 „ „ „ „	*18.89
1710 „ „ „ „	*18.66
1712 „ „ „ „	*18.66

* Under 70,000 lb., min. 600 lb.

ASRC (American Synthetic Rubber Corpn.) (carloads lots of 30,000 lb.)	(cifUKdp*)
1000 Hot, Non-Oil	23.99
1001 „ „	23.99
1004 „ „	23.99
1006 „ „	23.99
1009 „ „	24.61
1018 „ „	26.74
1019 „ „	26.26
1500 Cold, Non-Oil	23.99
1502 „ „	23.99
1503 „ „	26.02
3110 „ „	25.78
1703 Cold, Oil-Extended	20.69
1708 „ „	19.27

* US/£ conversion rate $2.80

Cariflex (Shell Chemical Company)	(e-sUK)
S-1000 Hot	22.0
S-1002 „	23.375
S-1006 „	22.0
S-1009 „	24.0
S-1011 „	24.0
S-1013 „	24.0
S-1100 Hot/black	19.75
S-1500 Cold	22.0
S-1502 „	22.0
S-1600 Cold/black	19.625
S-1602 „ „	19.625
S-1605 „ „	19.375
S-1703 Cold, Oil-Extended	20.25
S-1706 „ „	20.0
S-1707 „ „	17.75
S-1709 „ „	17.5
S-1712 „ „	17.5
S-1803 Cold, Oil/Black Masterbatch	17.875
S-1804 Cold, Oil/Black Masterbatch	19.25

Copo (Copolymer)	(cifUKdp)
1006 Hot, Non-Oil	23.25
1500 Cold, „	23.25
1502 „ „	23.25
1505 „ „	26.00
1712 „ Oil-Extended	18.50
1778 „ „	18.75
3900 „ Rosin-Extended	23.125

FR-S (Firestone)	(cifUKdp)*
1000 Hot	23.187
1001 „	23.187
1004 „	23.187
1006 „	23.187
1500 Cold	23.187
1502 „	23.187
146 „	23.187
1703 Oil-Extended	20.125
1712 „	18.5
123 „	19.187
155 „	18.5
173 „	20.125
178 „	18.75
1009 Specialty	24.625
1010 „	25.812
1012 „	24.187
1013 „	24.875
1014 „	27.75
1015 „	28.75
141 „	28.625
158 „	29.562

*US/£ conversion rate $2.80

International Synthetic Rubber Co.	(ex-wks)
Intol 1500	22
Intol 1502	22
Intol 1710	17.5
Intol 1712	17.5

Philprene (Phillips)	(e-qdp*)
1000 Hot, Non-Pigmented	23.28
1001 „ „	23.28
1006 „ „	23.28
1009 „ „	24.69
1010 „ „	25.86
1018 „ „	26.80
1019 Hot, Non-Pigmented	26.33
1100 Hot, Pigmented	19.65
1104 „ „	19.28
1500 Cold, Non-Pigmented	23.28
1502 „ „	23.28
1503 „ „	26.10
1601 Cold, Pigmented	19.56
1605 „ „	19.28
1703 Cold, Oil-Extended	20.23
1706 „ „	19.94
1708 „ „	18.82
1712 „ „	18.58
1803 „ Pigmntd, Oil-Extended	17.78
1805 „ „	15.99

*US/£ conversion rate $2.81½

Plioflex (Goodyear)	(fasUSport US Cents per lb.)
1006 Hot, Non-Pigmented	23.25
1500 Cold, Non-Pigmented	23.25
1502 „ „	23.25
1703 Cold, Oil-Extended	20.00
1710 „ „	18.25
1712 „ „	18.25
1713 „ „	16.9
1714 „ „	16.65
1773 Cold, Oil-Extended, Light-Coloured	20.00
1778 Cold, Oil-Extended, Light-Coloured	18.5

Polysar (Polymer UK)	(e-sUK)
S Hot	22
S630 „	22
Kryflex 200 Cold, for Cables	23.5
Krylene „	22
Krylene NS „ Non-Staining	22
Krynol 651 „ Oil-Extended	17.5
Krynol 652 „ „	17.75
SX 371 Process Aid	24

Synpol (Texas-U.S. Chemical Company)	(cifUKdp)
1000 Hot, Non-Oil	23.10
1001 „ „	23.10
1002 „ „	23.34
1006 „ „	23.20
1007 Hot, Non-Oil	23.20
1009 „ „	23.71
1012 „ „	23.24
1061 „ „	23.10
X-274	25.32
8000	23.94
1500 Cold, Non-Oil	23.10
1502 „ „	23.10
1551 „ „	23.10
1703 Cold, Oil-Extended	20.13
1707 „ „	18.71
1708 „ „	18.71
1711 „ „	18.62
1712 „ „	18.48
8200 „ „	18.71
8201 „ „	17.20
8150 Cold, Black Masterbatch	19.46
8253 Cold, Oil and Black Masterbatch	16.20
8254 Cold, Oil and Black Masterbatch	15.83
8256 Cold, Oil and Black Masterbatch	16.33

US/£ conversion rate $2.80

SBR LATICES

Copo (Copolymer) (10-ton lots)	(cifUKdp)
2101 (dry weight)	46.30
X-765 („ „)	40.80
X-800 („ „)	37.20
2102 („ „)	38.00
2105 („ „)	38.00
2110 („ „)	38.00

Naugatex (Naugatuck Chemical International)	(ex-wUK)
2000	39
2001	39
2002	39.5
2006	43
2105	40
2107	40
2108	40
2711	39
2714	39
2733	39
2740	43

Pliolite Rubber (Goodyear)	(d)
2000	40

Latex	
2001 (dry weight)	40
2104 „ „	40
2105 „ „	40
2108 „ „	40
5350 „ „	40

Pliolite Resin (Goodyear)	(d)
101A (dry weight)	44
150 („ „)	50
151 („ „)	35
160 („ „)	50
170 („ „)	50

Hycar (B. F. Goodrich)	(ddp)
2507 (high styrene) dry weight	48

Polysar (Polymer UK)	(e-sUK)
Latex, type II	38.5
Latex, type IV	32.5
Latex, type 721	33.5

International Synthetic Rubber Co.	(ex-wks)
Intol Latex R23	22
Intol Latex M23	22

ACRYLONITRILE TYPES

Butaprene N (Firestone)	(cifUKdp)
NL	52.5
NAA	56.25
NF	51.5
NXM	60.18

Chemigum	(e-s)
N—1	75
N—3A	52
N—5	52
N—6G	45
N—7	45
N—8	45
N600X	45

Hycar (British Geon) (500-lb. lots and over)	(UKd)
1001 High Nitrile Hot	52
1041 „ „ Cold	52
1002 Medium High Nitrile Hot	45
1042 „ „ „ Cold	45
Hycar (B. F. Goodrich) (500-lb. lots and over)	(ddp)
1411 High Nitrile (powder)	66
1432 Medium High Nitrile (crumb)	64
1072 Medium High Nitrile (carboxyl)	66
1312 Medium High Nitrile (liquid)	55
1043 Medium Low Nitrile	51
1014 Low Nitrile	61
I.C.I. (min. 5-cwt. lots)	(UKd)
Butakon A-4051 High Nitrile Cold	52
Butakon A-3051 Medium Nitrile High Mooney Cold	45
Butakon A-3002 Medium Nitrile Low Mooney Cold	45
Paracril (US Rubber)	(e-sUK)
18-80 Low Nitrile	63
AJ „ „	50
B Medium Low Nitrile	51
BJ „ „ „	51
BLT „ „ „ Cold	51
BJLT „ „ „ „	51
C Medium High Nitrile	59
CLT „ „ „ Cold	59
CV „ „ „(crumb)	60
D High Nitrile	67
ALT	51
Polysar (Polymer UK)	(d)
Krynac 800 Medium Nitrile	45
Krynac 802 Low „	45
Krynac 803 Medium „ (low Mooney)	45
Krynac 801 High Nitrile	52

ACRYLONITRILE LATICES

Butaprene N (Firestone)	(cifUKdp)
N-300 (dry weight)	53
N-400 („ „)	60.5
Chemigum Latex (Goodyear)	(d)
200 (dry weight)	65
235 CHS („ „)	60
236 („ „)	60
245 B („ „)	52
245 CHS („ „)	52
246 („ „)	52
247 („ „)	52
248 („ „)	52
Hycar (B. F. Goodrich) (dry weight, 3 drums and over)	(ddp)
1551 High Nitrile (large particle)	66
1552 Medium High Nitrile (large particle)	57
Hycar (British Geon) (dry weight, 3 drums and over)	(UKd)
1561 High Nitrile	60
1571 „ „ (carboxyl)	60
1562 Medium High Nitrile	52
1577 „ „ „ (modified)	

ACRYLIC TYPES

Hycar (B. F. Goodrich)	(ddp)
4021 Slab, 500 lb. and over	144
4501 Latex, dry weight	96

BUTYL TYPES

Esso	(e-sUK)
Regular 035	21.75
Regular 150	21.75
Regular 215	21.75
Regular 217	21.75
Regular 218	21.75
Regular 325	21.75
Non-staining 065	22.75
Non-staining 165	22.75
Non-staining 265	22.75
Non-staining 267	22.75
Non-staining 268	22.75
Non-staining 365	22.75

Vistanex (Polyisobutylene)	(e-qdp)
MS Low molecular weight	54
MH „ „ „	54
L-80 Medium molecular weight	54
L-100 „ „ „	54
L-120 „ „ „	54
L-140 „ „ „	54
Polysar (Polymer UK)	(e-sUK)
Butyl 100	21.75
Butyl 200	21.75
Butyl 300	21.75
Butyl 301 (non-staining)	21.75
Butyl 400	21.75
Butyl 101 (non-staining)	26.25
Butyl 402	22.5
Hycar (B. F. Goodrich) (500 lb. and over)	(ddp)
2202 Brominated	68

NEOPRENES

	(e-qdp)
W and WHV (dry weight del)	42.62
WRT („ „ „)	48.37
WX („ „ „)	44.62
GN („ „ „)	44.62
GNA („ „ „)	44.62
GRT and S („ „ „)	45.62
AC („ „ „)	57.125
KNR („ „ „)	75.62
AC'M'and'S' („ „ „)	57.125
CG („ „ „)	57.125
AD („ „ „)	57.125
Latices—Dry (per lb. del, min. 50 lb.)	
571	49.75
842A	49.75
572	51.25
601A	51.87
650	54.125
735	51.25
736	51.25
950	58.25
60	51.87
750	51.25
635	53.62

SILASTOMER

Midland Silicones (500 lb. lots del)	
Stocks	16s. 6d. to 35s.
Pastes	26s. to 35s.
Gums and base stock	36s. to 42s.
Cold-curing silicone rubber	20s. and 23s. 6d.

REINFORCING RESINS AND RUBBERS

I.C.I. (min. 2-ton lots)	(UKd)
Butakon S-8551	36.5
Butakon S-7001	33.5
Hycar (B. F. Goodrich)	(ddp)
2007 (powder)	42.5
Pliolite (Goodyear)	(d)
S—6B	36.5
Polysar (Polymer UK)	(e-sUK)
SS-250 (high styrene) (bale form)	27.25
SS-250 („ „) (flake form)	27.5
Kryflex 252 (high styrene)	25.5
Cyclite (Durham Raw Materials)	42

HYPALON

In 50-lb. bags del UK	71.62

Mr D. F. Grierson has resigned from the board of Tanah Estates.

Mr H. F. Morford has been appointed chairman of the Borneo Co. in succession to Mr C. R. Akers, who remains on the board.

COMPANIES in the NEWS

Imperial Chemical Industries

A final dividend of 5½% being paid by Imperial Chemical Industries makes 8% for 1958. This is the same as the 1957 payment of 12%, after adjusting for the one-for-two scrip issue. While group sales were unchanged at £463m., income before tax, contracted from £55.1m. to £44.5m. after an extra £5.1m. for depreciation. Deducting £20.7m., against £26.3m., for tax, the net profit is nearly £5m. down at £23.85m. (£28.81m.). There is £21.7m., against £26.8m., applicable to the parent.

Revertex Ltd.

Over 50% of the company's products are sold abroad to customers in 42 countries, it was stated by Mr T. Harcourt Powell, chairman, at the annual general meeting of Revertex Ltd. on March 24.

On products and processes, Mr Harcourt Powell said:

Revertex (concentrated rubber latex): Since our last report we have been reorganizing our factory in the Far East and have brought our plant up to date. Much technical progress has also been made and sales continue to be satisfactory.

Emultex (polyvinyl acetate emulsion): We continue to maintain our position in this field.

Alcotex (polyvinyl alcohol): We are making steady progress with this material and our plant is now capable of producing any quantity likely to be required for some time to come.

Processes: We have concentrated great efforts in developing processes and compounds to be used with our own materials. Much progress has been made during the year and the outlook is encouraging. We recently expanded our compounding plant at Harlow to take care of demand and we may have to make more additions in order to cope with further needs.

Profit, before tax, amounted to £397,373 as compared with £406,975 for the previous year, net profit being £178,373 (£190,975). The directors recommend the payment of a final dividend of 17½%, less tax, making with the interim dividend of 12½%, less tax, paid last November, a total of 30%, less tax, for the year.

British Oxygen Chemicals

In his annual report, the chairman of the British Oxygen Co. Ltd., Mr J. S. Hutchison, states that the subsidiary, British Oxygen Chemicals Ltd., once again substantially increased its sales and this, with increased efficiencies in the manufacture of melamine and polyvinyl acetate, resulted in appreciably higher profits. Sales were now being affected by some recession in the plastics industry and there are indications of increased competition in world markets for their products. They did not expect sales and profits next year to reach last year's levels and the tempo of future advance may be restrained.

Rubber Markets

LONDON

The recent improvement in the London rubber market was continued during the past week but prices are below their best levels following a reaction in mid-week. On balance, forward prices show little change but Spot and near positions are slightly higher. Spot is ⅛d. better at 27d. per lb. Business was small with activity restricted by holiday influences.

Latest prices are as follows:

No. 1 RSS Spot: 26⅞d.-27⅛d.

Settlement House:

May 26⅞d.-27d.

June 26⅞d.-27d.

July/September 27d.-27⅛d.

October/December 27d.-27⅛d.

January/March 27d.-27⅛d.

No. 1 RSS cif basis ports:

May 26⅝d.-26⅞d.

June 26⅝d.-26⅞d.

Godown:

April 90⅛ Straits cents nominal.

Latex

Centrifuged latex per gallon in drums, April/May shipment, 15s. 11d. seller, cif European ports. Spot, seller, 16s. 3d. Bulk, seller, 15s. 10d. Creamed, seller, 15s. 5d. Normal, seller, 12s.

AMSTERDAM

The Amsterdam rubber market on March 31 ruled as under:

	Guilders per kilo	
No. 1 RMA	Mar. 31	Previous
April	2.61½	2.58
May	2.62	2.58
June	2.62	2.58
April/June	2.61	2.58
July	2.63½	2.61
August	2.63½	2.61
September	2.63½	2.61
July/September ..	2.63	2.61½
October	2.63½	2.61½

Sales: Nil. Tendency: Steady.

DJAKARTA

It was a quiet session on March 31 with offerings rather scarce. The close was quiet. Export certificates were quoted at 332 paid/buyer.

	Rupiahs per kilo	
	Mar. 31	Previous
Spot No. 1 Priok ..	24.40b	24.20b
Spot No. 2 Priok ..	23.60b	23.40b
Spot No. 3 Priok ..	22.80b	22.60b
No. 1 fine pale crepe	23.85b	23.75b

Tendency: Quiet

BANGKOK

No. 1 RSS

The price for No. 1 RSS, at Bangkok on March 31 was 30.12½ (30.12½) US cents per lb.

NEW YORK

The New York rubber market on March 31 ruled as under:

Dealers' Prices

	US cents/lb., ex-dock	
	Mar. 31	Previous
No. 1 RSS, April	32¼b–32½a	32⅜b–32⅞a
May	32¼b–32½a	32⅜b–32⅞a
No. 2 RSS, April	31⅞b–32⅛a	32⅛b–32⅜a
May	31⅞b–32⅛a	32⅛b–32⅜a
No. 3 RSS, April	31⅜b–32a	31⅞b–32⅛a
May	31⅜b–32a	31⅞b–32⅛a
No. 1 RSS, Spot	32¼b–32½a	32⅜b–32⅞a
No. 3 amber blanket crepe, June	30⅞b–31⅛a	31⅛n
No. 1 latex, thin crepe, April ..	32¼n	32¼n
No. 1 latex, thick crepe, April ..	32¼n	32¼n

Futures—Rex Contract

	Close	Prev. Close
May ..	32.80b–32.85a	32.95–32.94t
July ..	32.60b–32.70a	32.84t
Sept. ..	32.60t	32.75t
Nov. ..	32.50t	32.74t
Jan. ..	32.45b–32.50a	32.60b–32.70a
March ..	32.50t	32.50b–32.60a
May ..	32.40b–32.50a	32.40b–32.55a

Sales: 63. Tendency: Steady.

Rubber futures, after showing small gains earlier, fell back during the afternoon, with losses ranging to about a quarter of a cent a lb. Dealings were modest. Meanwhile, very little business developed in the spot market despite a lowering of values. Some buyers still felt that prices were too high, and more conversation was being heard about switching to synthetic because of the prevailing asking prices for natural rubber.

Crepe Rubber

The following prices ruled in New York on March 25:

Dealers' selling prices:	Cents per lb.
Sole crepe, standard grade 'A'	46 (46)
Thick crepe	33¼ (33¼)

Synthetic Rubber

The following prices ruled in New York on March 25:

	Cents per lb.	
	Mar. 25	Previous
GR-S, fas New Orleans	23.25	23.25
Neoprene GN, fob Louisville	41	41
Neoprene W, fob Louisville	39	39
Butyl, fas New Orleans	23	23
Paracril, fob Baten Rouge	50	50

CEYLON

No. 1 RSS

The price for No. 1 RSS, spot, at Colombo on March 31 was 117½ (115½) Ceylon cents per lb.

SINGAPORE

The market opened higher on March 31 on better New York advices and a backlog of orders accumulated over the long weekend. After an active start, however, prices eased slightly on profit-taking and trading quietened down. The afternoon was generally quiet with interest mainly in number two sheet on Continental account. Number ones tended to ease slightly. Lower grades were generally difficult to come by. After-hours, the market was quiet.

	Straits cents per lb., fob Malayan ports to open ports	
	Close	Previous Close
No. 1 RSS, April..	92⅜—92½	91⅝—91½
May ..	92½—92⅝	91½ 92
No. 2 RSS, April..	91½—91⅝	90⅝—91½
No. 3 RSS, April..	90⅜—90⅝n	89⅝—90⅛
No. 4 RSS, April..	89 —90n	88½—89
No. 5 RSS, April..	87½—88½n	86½—87½
No. 1 Spot ..	92 —92½	91 —91½
No. 3 blanket, thick remilled, April..	86 —88	85½—87½
No. 1 fine pale crepe, April ..	95½—96½	95 —96
Thin brown crepe, April	86¾—87¾	86½—87½

Tendency: Quiet

The Industrial Syndicate quote latex, native produce, 60% centrifugal, packed in rec. drums fob at 180.60d. per gallon.

Export Opportunities

Water Piping for Grenada

The Director of Public Works in St. George's, Grenada, has informed the UK Trade Commissioner at Port of Spain, Trinidad, that his Government have a water project likely to involve expenditure of $700,000 or more in the near future, in connexion with which he would be glad to receive particulars of the availability of any suitable water piping (other than cast-iron or steel) of sizes from 2in. to 10in. dia. and suitable for Class 'C' pressures. Manufacturers interested in this enquiry should submit full details to Mr C. E. Belizaire, Director of Public Works, St. George's, Grenada, and should notify the UK Trade Commissioner, Colonial Building, South Quay (P.O. Box 225), Port of Spain, Trinidad, that they have done so. B.o.T. Reference: ESB/6679/59.

Rubber Hot Water Bottles and Rubber Ice Bottles for Salvador

La Proveeduria General de la Republica, Avenida España No. 53 (613) San Salvador, Republic de El Salvador, America Central 50(59), has issued the following requirements: 500 natural rubber hot water bottles, of 2-litre capacity, size 20cm. x 27½cm., with screw-cap of aluminium and rubber washer; 500 natural rubber ice bottles, preferably red in colour without seams, with screw-cap and rubber washer, moulded and round in shape with a diameter of 23cm. Closing date is April 9 1959.

A copy of the tender documents (in Spanish) is available for loan to UK firms. B.o.T. Reference: ESB/7906/59.

The address of the Export Services Branch of the Board of Trade is Lacon House, Theobalds Road, London, W.C.1. Telephone number: Chancery 4411, extensions 776 or 866.

Industry INTELLIGENCE

Technical Data

Seval Black

Seval black is an MT black with easy processing characteristics which make it valuable for extrusion compounds. It is employed as a low-cost filler and can be used at high loadings without undue stiffening or loss of resilience of the rubber. Its applications include compounds for tyre beads and tyre carcasses, airbags, cycle tubes and covers, belting and hose frictions, hose linings and covers, footwear and high grade mechanicals. Seval black is compared with lamp black and Dixie 20 (an SRF black) in Report No. 140/R/59, issued by the Anchor Chemical Co. Ltd., Manchester 11.

Natural rubber and SBR mixes were used, accelerated with Furbac and containing 50 phr of the blacks. Data are given for mixing properties, Mooney scorch time and Mooney viscosity of the unvulcanized compounds, and modulus, tensile strength, elongation at break, hardness, abrasion resistance and resilience of the vulcanized material. Compared with the compounds containing the other blacks, the Seval black compounds were the slowest scorching and had the lowest viscosity, while the Seval black vulcanizates had the highest resilience but the lowest hardness, tear strength and abrasion resistance. Tensile strength and modulus were also low in SBR but in natural rubber the lowest tensile strength was given by lamp black and the lowest modulus by Dixie 20. Thus the easy processing characteristics of Seval black correspond to a low level of reinforcement and high resilience.

Injection Moulding of Polythene

Rigidex polythene has properties which make it suitable for injection moulding of articles such as domestic bowls, buckets and other household utensils, hospital equipment and a wide range of industrial products. Detailed information on the injection moulding of this plastic is given in Rigidex Technical Information Sheet No. 2, issued by British Resin Products Ltd., Devonshire House, Piccadilly, London, W.1.

There are five grades of Rigidex polythene with melt indices ranging from 0.2 to 5.0 and data are given for the properties of these grades. Mould design is very important and factors to be considered are mentioned. Many moulds made for use with polystyrene are not suitable for moulding Rigidex polythene, particularly when close component dimensions are specified, because of the difference in the shrinkage of the two plastics. Accurate control of mould temperature is essential to produce warp-free mouldings with good surface finish and minimum internal stress. Ways of achieving the necessary temperature control are discussed with the aid of drawings, the most efficient method being by the use of temperature-controlled water circulating rapidly through the mould. Desirable features in the design of any new moulding in Rigidex polythene are listed together with particulars of moulding shrinkage. There is a final section on the moulding procedure.

Machines, Materials and Equipment

'Vertolifter' Elevator Trucks

With the introduction of new 1,200lb. and 1,600lb. capacity models, a complete range of 'Vertolifter' Hydraulic Elevator Trucks of basic standardized design is now available, namely 500, 800, 1,200 and 1,600lb. models. The latest models are available in two heights of lift, namely to 60in. or to 75in. They can be fitted with either fixed or laterally adjustable forks and detachable platforms are available. The hand pump models have a 2-speed hydraulic pump suitable for use at maximum load, alternatively a light load can be lifted more quickly. The battery electric model is supplied with a 12-volt heavy duty traction type battery and the mains electric models can have either 3-phase or single-phase motors of standard voltage ranges. Heavy gauge steel channel construction is used and all models are issued with a test certificate when dispatched. All moving parts have ball or roller bearings. These machines are suitable, the makers claim, for lifting goods, jigs, dies, press tools, stillages, also for stacking, loading and unloading vehicles and general stores use.

Hollow Bored Bars

The normal range of hollow bored bars produced by Keeton, Sons and Co. Ltd., a member of the Firth Cleveland group, has been extended to include bore diameters up to 6½in. in bars up to 10½in. OD. The maximum length in the normal range is now 18ft. Previous highest figures were 5in., 8in. and 12ft. respectively. Also in their normal range, Keetons now offer hollow bored bars or fabricated hydraulic cylinders with finished machined bores from ¾in. to 10in. diameter to a tolerance of ±.003in. Alternatively, these products can be supplied with honed finished bores from 2in. to 8in. diameter to a tolerance of ± .001in. Maximum length in each case is 15ft. Typical applications for such borings include high pressure bored bars for the chemical industry, fabricated rollers for the printing, rubber and aluminium industries, hollow bored shafts for machine tools, heavy transport and earthmoving equipment, and hollow compression shafts for jet engines.

Thermo-setting Silvering Preparation

Johnson, Matthey and Co. Ltd., 73-83 Hatton Garden, London, E.C.1, announce the development of a new thermo-setting silvering preparation that has been given the code name FSP 36. The preparation is based on silver in the form of finely divided flake and is specifically designed to enable surface films of relatively high conductivity to be applied by spraying or brushing to such materials as plastics, ceramics, graphite and glass. Alternatively it may be used as a conducting cement. The only limitation on its application is that the material being coated must withstand heating to 100°C., the minimum temperature necessary for curing the organic vehicle that carries the silver. The preparation has good covering power and the stoved film is hard and abrasion-resistant, with an electrical resistance in the range 0.2 to 2 ohms per square.

Publications Received

I.C.I. Plastics

A booklet entitled, 'I.C.I. Plastics in Industry,' which has been issued to coincide with the tour of the company's mobile exhibition, 'Plastics Division on Wheels,' explains, with illustrations, some of the applications of the products of the division. The booklet, which is intended for I.C.I. employees, also gives a brief account of the growth of the Plastics Division to become the largest producer of plastics in the Commonwealth and among the half-dozen largest producers in the world.

'Turnall' Plastic Washer

An illustrated leaflet from Turners Asbestos Cement Co. Ltd., of Trafford Park, Manchester 17, describes the 'Turnall' plastic washer, which is designed to provide a tight fit to the crown of any asbestos cement sheet profile. It is suitable, the makers state, for use with both ¼in. and 5/16in. diameter of all types of fixing accessories, including aluminium of the rolled thread type, and does not require a secondary felt washer. A further new product is the 'Turnall' plastic protective cap which fits securely over both the upstand boss of the washer and also the head or nut of the ¼in. or 5/16in. diameter fixing accessories.

Future Events

INSTITUTION OF THE RUBBER INDUSTRY

Tuesday, April 7.—Meeting of the Education Committee at 10.30 p.m., and of the Examinations and Qualifications Board at 2.30 p.m.

Wednesday, April 8.—Meeting of the Papers and Publications Committee at 9.45 a.m., of the Finance Committee at 11.45 a.m., and of the Executive Committee at 2.30 p.m.

Leicester Section.—Friday, April 10, at the Bell Hotel, Leicester, at 7.30 p.m. Annual general meeting and short papers evening.

London Section.—Tuesday, April 14, at the Criterion, Piccadilly, London, W.1, at 6.30 p.m. Annual general meeting.

Manchester Section.—Monday, April 13, at the Engineers' Club, Manchester. Annual general meeting and social evening.

Merseyside Section.—Monday, April 13, at the Exchange Hotel, Liverpool, at 7.15 p.m. Annual general meeting, followed by hot pot supper.

Midland Section.—Monday, April 13, at the Goodyear Tyre and Rubber Co., Ltd., Wolverhampton. 'Personnel Management—the Human Factor in Productivity,' by J. Maslin, F.I.P.M., M.B.I.M., Accles and Pollock Ltd.

North-Eastern Section. — Monday, April 6. Annual general meeting and dinner.

Preston Section.—Monday, April 6, at the Bull and Royal Hotel, Church Street, Preston, at 7.15 p.m. Annual general meeting, to be followed by a film entitled 'The Titanium Pigment Story,' and a short talk on the subject.

South Wales and Monmouthshire Section.—Monday, April 13, at the Angel Hotel, Cardiff, at 7.30 p.m. Annual general meeting.

PLASTICS INSTITUTE

North-Eastern Section.—Wednesday, April 15, in the Second Dining Room of the Eldon Grill, Grey Street, Newcastle, at 7 p.m. Annual general meeting.

Scottish Section.—Wednesday, April 15. Visit to the Singer Manufacturing Co. Ltd., Clydebank.

South Wales and Monmouthshire Section.—Wednesday, April 8, at the Angel Hotel, Westgate Street, Cardiff, at 6.30 p.m. 'Newer Processes for Treatment of PVC,' by I. Phillips, B.Sc., British Geon Ltd.

Yorkshire Section. — Wednesday, April 15, at St. Mark's House, 186 Woodhouse Lane, Leeds. Annual general meeting and visit by the president, Dr J. C. Swallow.

EXHIBITIONS

Corrosion Exhibition, Royal Horticultural Hall, London, April 27-30.

Engineering, Marine, Welding and Nuclear Energy Exhibition, Olympia, London, April 16-30.

Factory Equipment Exhibition, Earls Court, London, April 7-17.

Heat and Sound Insulation Exhibition, Earls Court, London, April 7-17.

Plastics and Polymer Group, Society of Chemical Industry.—Tuesday, April 7, at the SCI Meeting Room, 14 Belgrave Square, London, S.W.1, at 6.30 p.m. 'Applications of Gas Liquid Chromatography in a Plastics Analytical Department,' by Dr J. Haslam and Mr A. R. Jeffs, Imperial Chemical Industries Ltd., and 'Differential Thermal Analysis of some High Polymers,' by Mr C. D. D'Oyly-Watkins, Mr G. L. Palmer and Mr C. M. Robertson, Ministry of Supply, Woolwich.

PATENT LIST

Printed copies of the Specifications in the following list can be obtained from the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d., including postage, but about six weeks after the date of this publication will usually elapse before they come available. Orders with remittance may be sent in advance to the Patent Office, and will be fulfilled immediately the Specifications are published.

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection on March 25 1959

Regie Nationale des Usines Renault. Formation of panels of plastic materials. 810,810.

E. I. du Pont de Nemours and Co. Manufacture of monovinylacetylene. 810,761.

Balfour, Beatty and Co. Ltd., and Andrè Rubber Co. Ltd. Spacing devices for overhead cables. 811,038.

E. I. du Pont de Nemours and Co. Coating of polythene terephthalate film. 810,854.

J. Bull. Heat-sealing of plastic films. 810,742.

Greengate and Irwell Co. Ltd. Production of polyvinyl polymers and in conveyer and similar belting produced therefrom. 810,841.

D. Napier and Son Ltd. Solid foam products produced from polyester resins and polyisocyanates. 810,839.

Air Reduction Co. Inc. Copolymers of trifluoroethyl vinyl ether and vinyl esters. 811,037.

Goodyear Tire and Rubber Co. Wheel structure. 811,014.

E. I. du Pont de Nemours and Co. Coated thermoplastic polymeric films. 810,722.

E. I. du Pont de Nemours and Co. Coated thermoplastic polymeric films. 810,721.

Chemische Werke Hüls A.G. Stuck sleeve or socket joints in polythene pipes. 810,891.

E. I. du Pont de Nemours and Co. Polythene structures. 810,723.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any post order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

HARTSDALE (783,351) For waxed parchment paper and non-medicated waxed paper tissues, all being greaseproof goods for domestic use in lining shelves, cupboards and the like and for cooking; and wrapping and packaging materials included in Class 16 made of cellulose paper, non-medicated greaseproof paper tissues, greaseproof waxed parchment paper or of polythene plastics. By Ramsbottom, Lyons and Co. Ltd., Hartsdale House, Mill Lane, Cheadle, Cheshire. To be associated with No. 679,907 (3752, 223). (Class 16; March 4 1959.)

COMMANDER (782,283) For hose-pipes not wholly or principally of metal. By BTR Industries Ltd., Hertz House, Vincent Square, London, S.W.1. (Class 17; March 4 1959).

NAUGAWHITE (783,293) For chemical preparations for use in the manufacture or processing of rubber or of synthetic rubber, or of latices of rubber or synthetic rubber for improving their resistance to the effects of light, heat and of oxygen. By the United States Rubber Co., Rockefeller Center, 1230 Avenue of the Americas, New York. Address for service is c/o T. A. Clayton, 62 and 64 Horseferry Road, London, S.W.1. (Class 1; March 11 1959).

(782,852) For scientific apparatus and instruments included in Class 9 made wholly or principally of plastics. By H. J. Elliott Ltd., E-Mil Works, Treforest Industrial Estate, Pontypridd, Glamorganshire. To be associated with No. 578,460 (3110, 15[illegible]).

SOLUFILM (779,178) For chemical products for use in the manufacture of films of plastics. By Société des Usines Chimiques Rhone-Poulenc, 21 Rue Jean-Goujon, Paris 8e, France. Address for service is c/o W. P. Thompsons and Co., 329 High Holborn, London, W.C.1. To be associated with No. 779,179 (4209, 275). (Class [illegible] March 11 1959).